

# WATER QUALITY MONITORING PROGRAM DATABASE USER'S GUIDE

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# **WATER QUALITY MONITORING PROGRAM DATABASE DOCUMENTATION**

## **Prepared For:**

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## Introduction

The Lummi Water Resources Division operates an extensive water quality-monitoring program for both surface water and ground water sites across the Lummi Reservation. Data management logistics, and federally mandated reporting requirements, have meant that data storage and retrieval has become too complex for the spreadsheet software that had been used historically. Consequently, an Access 2000 database has been created to store all relevant data and associated quality assurance (QA) metadata. The main aims of this database are:

1. To facilitate storage of all water quality monitoring data from Surface Water and Ground Water locations
2. To export these data in a format that is compatible with the EPA-mandated WQX/STORET Oracle database
3. To export data in a format that is compatible with the Utah State University's (USU) Time Series Analyst software product and associated data viewer (mapview)
4. To export these data in a format that is compatible with the Hydrogeoanalyst GIS extension

The purpose of this document is to guide users of the database through the various steps of entering, exploring, and exporting data. Users interested in the underlying table structure of the database are referred to the document "WATER QUALITY MONITORING PROGRAM DATABASE DOCUMENTATION" (filename: DataBaseDocumentation.doc).

Any questions or issues not addressed by this document may be referred to Craig Dolphin at Lummi Natural Resources (360 384-2387), or Jeremy Freimund at Lummi Water Resources (360 384-2212).

Changes and additions to the database will occur in the near future so this document should be considered provisional at this time.

## Main Menu

On opening the database file, the following form should automatically open.

The screenshot shows a software menu window titled "Lummi Water Resources: WQ Monitoring DB: Menu". The window has a purple background and contains several sections of buttons. At the top, it says "Welcome to the Lummi Water Quality Monitoring Database" and "What do you want to do?". The sections are: "Enter Data" with buttons for "Enter Water Qual. Data By Run", "Enter Lab Results", "Add New Site To Existing Run", "Setup Run Defaults", "View/Add Parameters", "Print Data-Entry QA Report", and "View/Edit Data Quality"; "Explore Data" with buttons for "View Sampling Dates", "Lookup Site Details", "Lookup Time Series Data", "Fecal Coliform Trends", "Regression Analysis", "Information about Runs", and "Water Quality Classifications"; "Export Data" with buttons for "Create WQX Tables", "Update Time Series Analyst DB", and "Export to Excel"; and "Supporting Documents" with radio buttons for "Userguide", "Table Documentation", "QAPP", and "WQX User Guide", followed by an "Open" button. At the bottom are two buttons: "Quit Database" and "Close Menu".

Enter Data	Explore Data
Enter Water Qual. Data By Run	View Sampling Dates
Enter Lab Results	Lookup Site Details
Add New Site To Existing Run	Lookup Time Series Data
Setup Run Defaults	Fecal Coliform Trends
View/Add Parameters	Regression Analysis
Print Data-Entry QA Report	Information about Runs
View/Edit Data Quality	Water Quality Classifications

Export Data	Supporting Documents
Create WQX Tables	<input checked="" type="radio"/> Userguide
Update Time Series Analyst DB	<input type="radio"/> Table Documentation
Export to Excel	<input type="radio"/> QAPP
	<input type="radio"/> WQX User Guide
	Open

Quit Database Close Menu

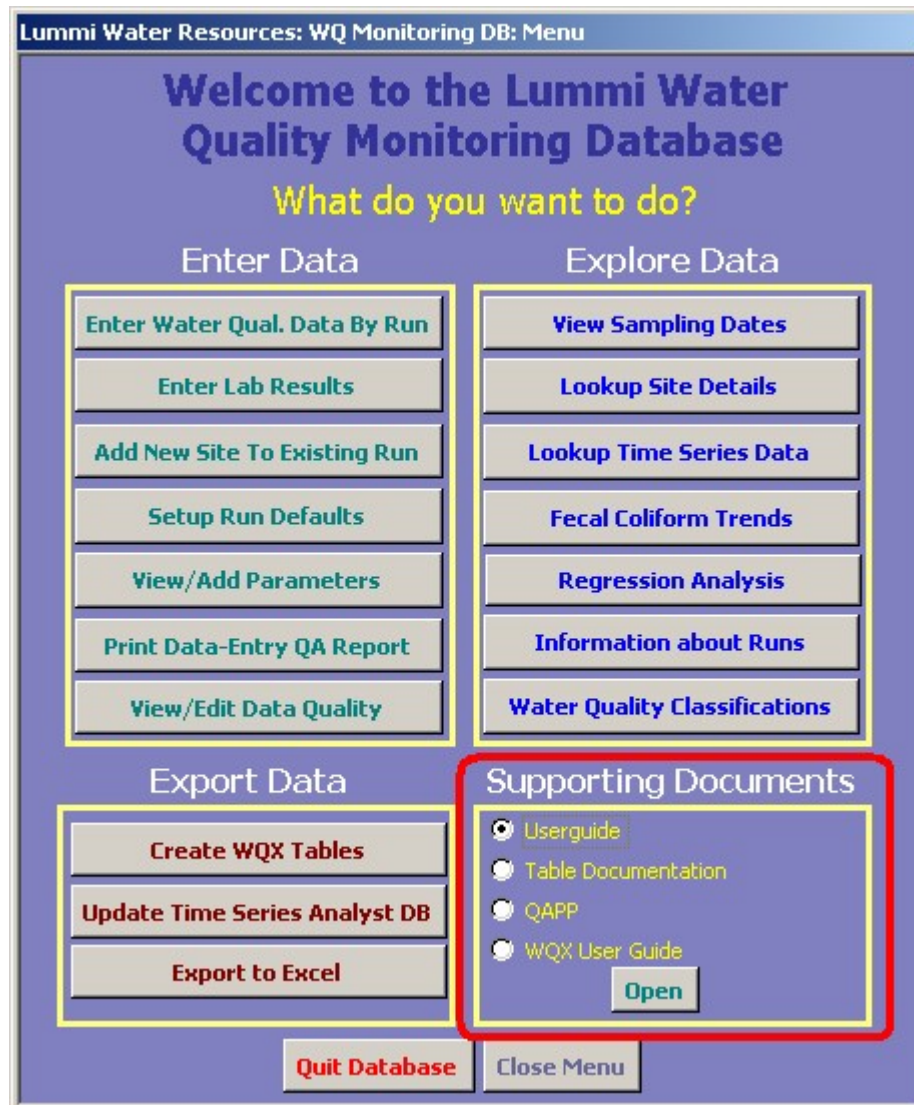
This form is referred to as the main menu and it provides the jumping-off point for all user activities. At the bottom of the main menu are two buttons: 'Quit Database' and 'Close Menu'. The first button shuts down the database program. The second button will close the main menu form while leaving the database itself open in the background. To view the database window the user will have to

select the Window menu on the Access toolbar at the top of the screen, select 'Unhide', then 'Ok'. To return to the Main Menu from the database window, select the forms collection, and then double-click on the form titled 'Menu'.

The main menu is divided into four main sections that each describes kinds of activities that can be performed by the user. These groupings are: 'Supporting Documents', 'Enter Data', 'Explore Data', and 'Export Data'.

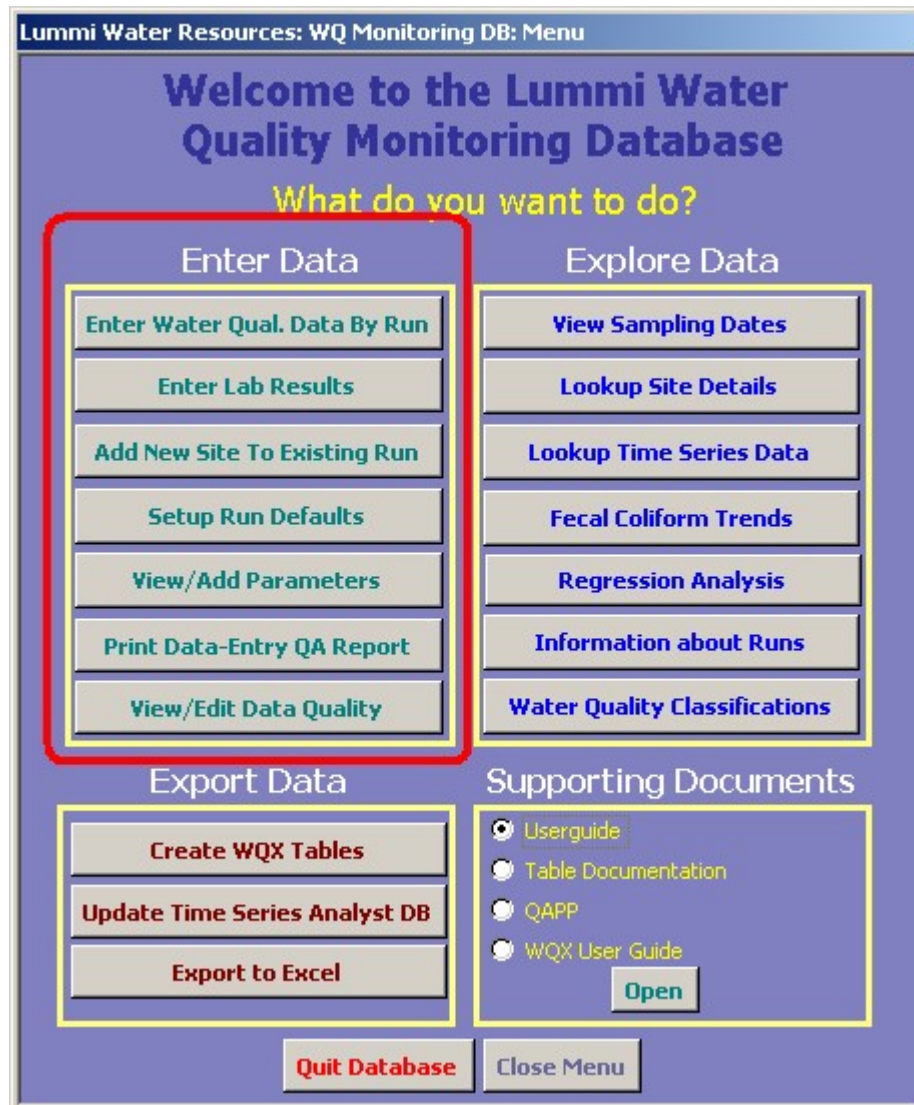


## Supporting Documents



The user may also choose to open one of three documents from the main menu by selecting one of the three documents listed, and clicking the 'Open Document' button. The three documents, including the most recent version of this document, are stored in the DOCUMENTS subfolder of the database's folder.

## Entering Data



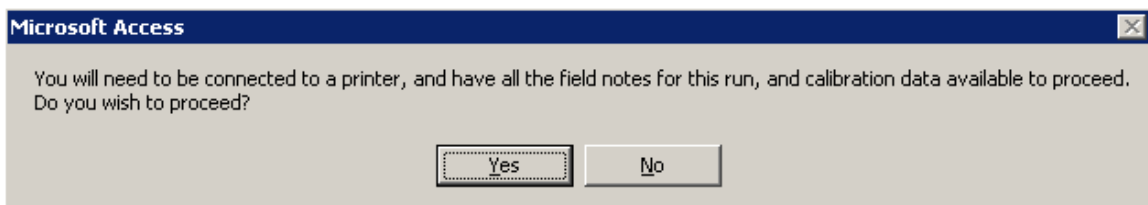
There are six buttons that serve to help the user enter data into the database.

## ‘Enter Water Quality Data By Run’

The first button guides the user through the process of entering sampling data into the database. This process uses previously defined, named sample-runs to automatically cycle through a list of default sites, default equipment, and default parameters for that type of run and thereby save the user the task of manually entering that predictable information. The user has the opportunity to add or subtract sites and equipment to those created from the default lists prior to enter sample results.

### STEP 1

When the button is pressed a warning appears:



The intent of this warning is to ensure that the user has all the information necessary to completely enter *field* results, metadata (such as method/equipment etc) and QA/QC information for all sites sampled during the sampling run. It is not necessary to have the actual results or QA/QC result for *lab* samples at the time of data entry, although placeholder records for these will be generated during the data entry process.

If the user attempts to cancel data entry mid-way through a run, all data entered for the run will be deleted in order to avoid double entry of the same data. The only exception to this occurs when the user elects to 'pause' data entry after entering complete information for a site.

Also, if the run is a groundwater run, make sure that any meters that totalizer results may be entered for **are already known to the database** before proceeding.

A printer is necessary in order to generate the QA review forms at the end of the data entry process.

After the user clicks 'Yes', the Menu will disappear and a new form will open.

The screenshot shows a software window titled "fmDataEntry\_RunInfo : Form". The window has a blue background and contains the following elements:

- Run Performed:** A text box with a dropdown arrow on the right.
- ☐ **Include Metals/Nutrients/Hydrocarbons etc?**
- Date:** A text box.
- ☐ **Run planned but cancelled?**
- Comment:** A large text area.
- Personnel:** A label above a text box with a dropdown arrow.
- Two radio buttons: ☒ **Field Crew** and ☒ **Data Entry**.
- At the bottom, two buttons: **Next** (in green text) and **Cancel** (in yellow text).

This form lets the user select what type of run they wish to enter data for. Clicking the down arrow at the right end of the *Run Performed* box reveals the dropdown menu which lists all previously defined named-runs.

fmDataEntry\_RunInfo : Form

Run Performed: [Dropdown Menu]

Date: [Text Field]

Comment: [Text Field]

Pers: [Text Field]

Next Cancel

Run Types List:

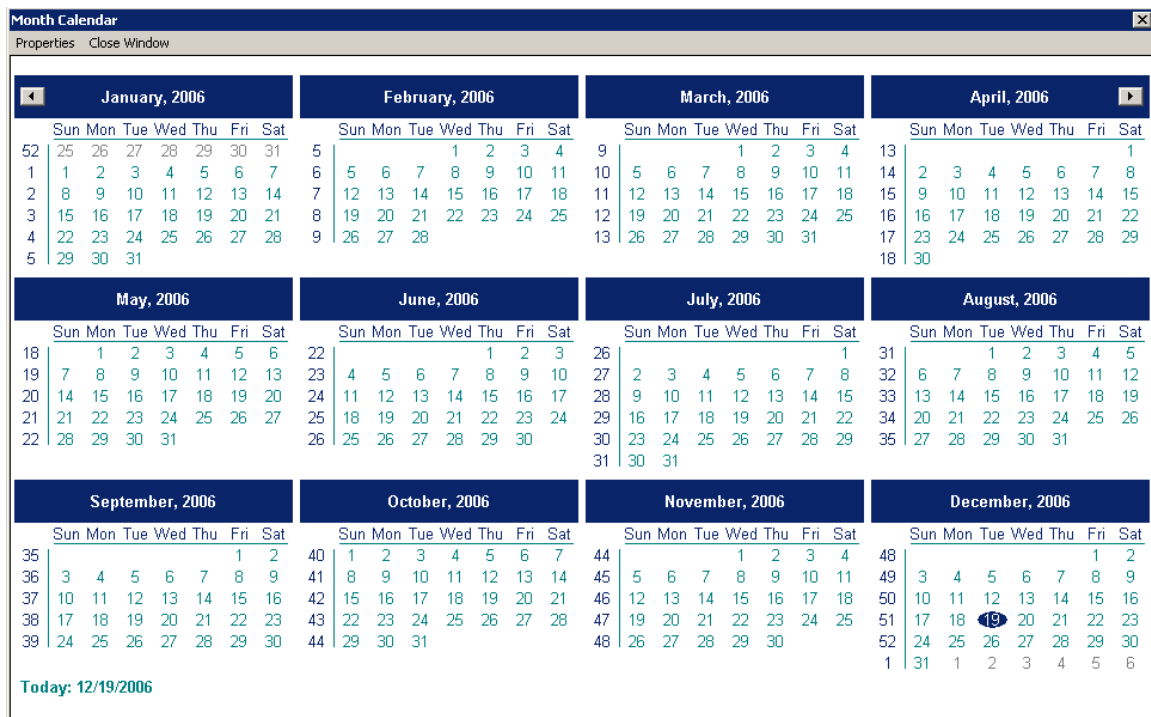
- GW - Datalogging
- GW - Johnson Well
- GW - Lummi Peninsula Private
- GW - Lummi Peninsula Tribal Water Supply Wells
- GW - Northwest Reservation
- Other - Undefined
- Spill Response - BioHazard Spill
- Spill Response - HazMat Spill
- SW- Bellingham Bay Watershed - First Flush
- SW- Floodplain East (FPE)**
- SW- Floodplain West (FPW)
- SW- Lummi Bay DOH Support
- SW- Lummi Bay Watershed - First Flush
- SW- Lummi Shore Road (LSR)
- SW- Marine Boat Accessible (Marine)
- SW- Portage Bay DOH Support

The example above shows the run 'Floodplain East (FPE)' being selected from the list. Each run name is preceded with an indicator that is used to indicate whether a run is a surface water (SW) site run, a ground water site run (GW), a spill response type run, or another type of run that has not been defined. All the SW and GW runs shown above are referenced in the Lummi Nation Quality Assurance Project Plan, Version 3.0 (2006) (hereafter referred to as the 'QAPP'). Using these named runs will save the user from having to manually enter the default list of sites, equipment, and parameters. However, the user will still have the option of adding or deleting from these lists for the purposes of entering data for this run.

The Spill-response runs have no pre-defined sites because spills are not spatially predictable but the equipment used, and parameters to be measured, can be predicted in advance.

If the user wishes to make an unguided data entry they can select 'Other-Undefined' and then specify their own list of sites, equipment, and parameters without any further assistance from the database. This will require that the user must specify all required metadata fields that accompany the actual value.

After the user has selected the type of run they wish to use, they must then specify the date when the run was performed. To do this, the user left-double-clicks inside the date box which will open a calendar. When the calendar opens, the current date will appear in a dark-blue circle. If the user wishes to type in the value manually, they may single left-click inside the date box and the calendar will not open.



The number of months displayed by the calendar can be altered by clicking on the 'Properties' menu, at the top-left of the calendar, then 'Viewable Months' then selecting the number of months the user wishes to see.



To select a date for the run, simply left-click on the relevant date in the calendar. The calendar should close automatically and the date should appear in the *Date* box.

Before the user progresses, they have the opportunity to enter any general comments about the run (site-specific comments can be entered later).

If appropriate, they may also check the '*Include Metals/Hydrocarbons/Nutrients*' box. This checkbox indicates that this run is one of the periodic runs where additional parameters are measured as well as the usual parameters. By checking this box, the additional parameters will be automatically added to the list of measurements for those sites where they are scheduled to be taken (in the QAPP). If the user forgets to check this box, the additional parameters will need to be added manually later.

If the run was scheduled but not actually performed, the user may select the '*Run planned but cancelled?*' check box. This will save a record of the intended run, and any comments about why it was cancelled, and then terminate the data entry process. **Leave this box unchecked if any data was actually collected during this run.**

Finally, the user must input the names of at least one field crewmember, and one data entry person. If the name of the person is not listed in the drop down box, the user may type in the name manually. A new form will appear prompting the user to input whatever information they can about the new person. When entering details for a new person, it is not necessary to fill in all information about the new person except their names.



fmDataEntry\_RunInfo : Form

Run Performed: SW- Floodplain East (FPE)

☐ Include Metals/Nutrients/Hydrocarbons etc?

Date: 2/19/2007 ☐ Run planned but cancelled?

Comment:

**Personnel:**

	Craig Dolphin	<input type="radio"/> Field Crew <input checked="" type="radio"/> Data Entry
	Dean Martin	<input checked="" type="radio"/> Field Crew <input type="radio"/> Data Entry
*		<input type="radio"/> Field Crew <input type="radio"/> Data Entry

Next Cancel

After all the relevant information has been entered, the user may click on the 'Next' button to move to the next step.

## STEP 2

Equipment Taken...	...to Measure This Parameter	Add Calibration/Checks		
WTW 330 with TetraCon 352 Probe	Salinity	Calibration	Calibration Check	0 Entered Edit
WTW 330 with TetraCon 352 Probe	Specific Conductivity - Field	Calibration	Calibration Check	0 Entered Edit
WTW 330 with TetraCon 352 Probe	Water Temperature - In Situ	Calibration	Calibration Check	0 Entered Edit
Oxyguard Handy Mk III Portable DO Meter	Dissolved Oxygen	Calibration	Calibration Check	0 Entered Edit
Oxyguard Handy Mk III Portable DO Meter	Percent Saturation	Calibration	Calibration Check	0 Entered Edit
Handheld pH/mV/Temperature Meter	pH - Field	Calibration	Calibration Check	0 Entered Edit
Handheld pH/mV/Temperature Meter	Water Temperature - pH Field	Calibration	Calibration Check	0 Entered Edit
Hach 2100P Portable Turbidimeter	Turbidity	Calibration	Calibration Check	0 Entered Edit
Thermometer - Armored, non-toxic, liquid-in-gla	Air Temperature	Calibration	Calibration Check	0 Entered Edit
		Calibration	Calibration Check	0 Entered Edit

Save Equipment List Cancel

The equipment taken form will open after the run information form closes. This form should list an array of default equipment that should be taken on a particular run, and show which specific parameter is to be measured with each item.

If the equipment taken on the run differs from normal, the user may select the drop down menu beside the name of the default item and select another item of equipment instead. This information is used to automatically enter in the default equipment identity associated with each value for the duration of the run.

If other items are taken in addition to the default list, the user may add them below the existing list (see figure next page), making sure to identify which parameter(s) are associated with each additional item.

Equipment Taken...	...to Measure This Parameter	Add Calibration/Checks	
WTW 330 with TetraCon 352 Probe	Salinity	Calibration	Calibration Check   0 Entered   Edit
WTW 330 with TetraCon 352 Probe	Specific Conductivity - Field	Calibration	Calibration Check   0 Entered   Edit
WTW 330 with TetraCon 352 Probe	Water Temperature - In Situ	Calibration	Calibration Check   0 Entered   Edit
Oxyguard Handy Mk III Portable DO Meter	Dissolved Oxygen	Calibration	Calibration Check   0 Entered   Edit
Oxyguard Handy Mk III Portable DO Meter	Percent Saturation	Calibration	Calibration Check   0 Entered   Edit
Handheld pH/mV/Temperature Meter	pH - Field	Calibration	Calibration Check   0 Entered   Edit
Handheld pH/mV/Temperature Meter	Water Temperature - pH Field	Calibration	Calibration Check   0 Entered   Edit
Hach 2100P Portable Turbidimeter	Turbidity	Calibration	Calibration Check   0 Entered   Edit
Thermometer - Armored, non-toxic, liquid-in-gla	Air Temperature	Calibration	Calibration Check   0 Entered   Edit
Hach 2100P Portable Turbidimeter		Calibration	Calibration Check   0 Entered   Edit

Save Equipment List Cancel

If an item of equipment is calibrated (physically adjusted) **pre** or **post-run**, or the accuracy of the equipment is checked against a known standard (calibration checked/validated) **pre** or **post-run**, then the user should click the relevant 'Calibration' button or the 'Calibration Check' button next to the appropriate equipment and parameter. **Mid-run calibrations are entered later in the data entry process (Step 5).**

Clicking either of the buttons will open a form, which allows the user to input this information. The number of calibrations and calibration checks entered for each parameter for item of equipment is shown to the right of the buttons. The user may input as many calibrations/calibration checks as they like for each combination of equipment and parameter.

When a 'Calibration' or 'Calibration Check' button is pressed, a form will open with the date of the run, parameter name, and units already filled-in. The user must input whether the event occurred pre or post-run, and then enter the appropriate Reference, Equipment and other attribute value(s).

As an example, if a field crew performs an air-check for a dissolved oxygen meter they adjust the meter (if necessary) so that it reads 100% saturation in air. Because the meter will be physically adjusted to ensure that the equipment is reading 100% this is a *calibration* (even if the meter does not need adjustment). If the same meter is then used to read the DO in a solution that is known to be 0% saturated and the resulting measurement is recorded (but the meter will not be physically adjusted) then this would be a *calibration check*. No other attribute information is recorded for either of these two events.

The screenshot shows a software form titled "fmAddCalibrationCheck : Form". The form has a yellow background and a blue header bar. It contains several input fields and buttons. The "Date" field is set to "2/28/2007". The "Parameter" dropdown is set to "Oxygen - % Saturation". The "Equipment" dropdown is set to "Oxyguard Handy Gamma Porta". The "Type" section has two radio buttons: "Calibration" (selected) and "Calibration Check". The "Status" section has two radio buttons: "Pre-Run" (selected) and "Post-Run". There are two rows of input fields for "Reference Value" and "Equipment Value", each with a "Units" dropdown. The first row shows "100%" for both. The second row shows "0" for both. There are also fields for "Sample Temp (C)", "Reagent Lot #", and "Expiry Date". At the bottom, there are two buttons: "Save and Close" and "Delete Event".

This shows inputting of *calibration* information for a pre-run air-check.

**fmAddCalibrationCheck : Form**

**Date:** 2/28/2007

**Parameter:** Oxygen - % Saturation

**Equipment:** Oxyguard Handy Gamma Porta

**Type:** ☐ Calibration ☒ Calibration Check

**Status:** ☒ Pre-Run ☐ Post-Run

	Reference Value:	Units:	Equipment Value:	Units:	Sample Temp (C)	Reagent Lot #:	Expiry Date:
▶	0	%	6	%			
*	0		0				

**Save and Close** **Delete Event**

This shows inputting *calibration check* information for a pre-run zero-DO validation.

The reference value contains the actual/known value of the reference solution, and the equipment value contains the measurement made by the item of equipment. If more than one reference solution is used, more lines can be added below.

There are also additional fields for the user to input other information about the calibration measurements. For specific conductivity and pH calibrations and calibration checks, this information includes the temperature of the sample during the calibration measurement, as well as the lot number and expiration date of any reagents used.

Note: If an additional value is erroneously created below the last real value then the user may delete it by left clicking on the gray record selector to the left of the Reference Value box (the record selector should turn black with a white arrow). Then the user should press the 'delete' key on their keyboard.

Once the calibration check information is entered for that parameter for that item of equipment, click 'Save and Close' and repeat the process for each calibration/validation performed before, during, or after the run for each parameter calibrated/checked for item of equipment. It is strongly recommended that the time recorded for mid-run calibrations or calibration checks be the same time recorded for the site-visit time.

Once the calibration form closes the counter on the main equipment form will change to reflect the new information.

Equipment Taken...	...to Measure This Parameter	Add Calibration/Checks	
WTW 330 with TetraCon 352 Probe	Salinity	Calibration	Calibration Check
WTW 330 with TetraCon 352 Probe	Specific Conductivity - Field	0	Entered
WTW 330 with TetraCon 352 Probe	Water Temperature - In Situ	0	Entered
Oxyguard Handy Mk III Portable DO Meter	Dissolved Oxygen	0	Entered
Oxyguard Handy Mk III Portable DO Meter	Percent Saturation	2	Entered
Handheld pH/mV/Temperature Meter	pH - Field	0	Entered
Handheld pH/mV/Temperature Meter	Water Temperature - pH Field	0	Entered
Hach 2100P Portable Turbiditymeter	Turbidity	0	Entered
Thermometer - Armored, non-toxic, liquid-in-gla	Air Temperature	0	Entered
		0	Entered

This shows the main equipment form with 2 calibration events input for the Percent Saturation parameter for the DO meter

If, for some reason, the user wishes to edit information about a calibration event that they have already entered, then they may click on the edit button next to the relevant equipment/parameter and the calibration event form will re-open.

However, if more than one event has been entered for that line, the user will need to navigate to the specific event using the four navigation buttons that will appear to the left of the Save & Close button. The user may then alter the information or delete the entry altogether (using the delete button).

**fmAddCalibrationCheck : Form**

**Date:** 2/28/2007 **Parameter:** Specific Conductivity - Field **Equipment:** YSI 5-C-T Model 30

**Type:** ☐ Calibration ☒ Calibration Check **Status:** ☐ Pre-Run ☒ Post-Run

	Reference Value:	Units:	Equipment Value:	Units:	Sample Temp (C)	Reagent Lot #:	Expiry Date:
▶	0	uS/cm	3.8	uS/cm			
	0	uS/cm	2.5	uS/cm			
*	0		0				

First Prev Next Last **Save and Close** Add New Event Delete Event

This shows the calibration event form in editing mode.

After all calibration checks and equipment items have been entered; the user can click on 'Save Equipment List' and progress to the next step.

### STEP 3

Site ID	Visited
SW015	<input checked="" type="checkbox"/> Visited
SW016	<input checked="" type="checkbox"/> Visited
SW017	<input checked="" type="checkbox"/> Visited
SW051	<input checked="" type="checkbox"/> Visited
SW052	<input checked="" type="checkbox"/> Visited
SW055	<input checked="" type="checkbox"/> Visited
SW056	<input checked="" type="checkbox"/> Visited
SW059	<input checked="" type="checkbox"/> Visited
SW072	<input checked="" type="checkbox"/> Visited
	<input checked="" type="checkbox"/> Visited

Next Cancel

The next form to open lists the default sites that are usually visited during a run. The user can opt to delete any of these sites by unchecking the ‘*Visited*’ checkbox if the site was not actually visited during the run. The user may also add another site to the list of visited sites by selecting the site number from the drop-down list.



The image shows two sequential screenshots of a software dialog box titled "fm\_DataEntry\_SitesVisited : ...". The dialog box has a light blue background and a title bar with standard window controls. The main area is titled "Sites Actually Visited..." and contains a list of sites, each with a dropdown menu and a "Visited" checkbox. At the bottom, there are "Next" and "Cancel" buttons.

**Left Screenshot:**

Site ID	Visited
SW015	<input checked="" type="checkbox"/>
SW016	<input checked="" type="checkbox"/>
SW017	<input checked="" type="checkbox"/>
SW051	<input checked="" type="checkbox"/>
SW052	<input checked="" type="checkbox"/>
SW055	<input checked="" type="checkbox"/>
SW056	<input checked="" type="checkbox"/>
SW059	<input type="checkbox"/>
SW072	<input checked="" type="checkbox"/>
SW006	<input checked="" type="checkbox"/>
SW007	
SW008	
SW009	
SW010	
SW011	
SW012	
SW013	

**Right Screenshot:**

Site ID	Visited
SW015	<input checked="" type="checkbox"/>
SW016	<input checked="" type="checkbox"/>
SW017	<input checked="" type="checkbox"/>
SW051	<input checked="" type="checkbox"/>
SW052	<input checked="" type="checkbox"/>
SW055	<input checked="" type="checkbox"/>
SW056	<input checked="" type="checkbox"/>
SW059	<input type="checkbox"/>
SW072	<input checked="" type="checkbox"/>
SW006	<input checked="" type="checkbox"/>
	<input checked="" type="checkbox"/>

In this example, site SW059 was not visited during this run but SW006 was added to the normal list of sites for this run.

If the type of run is a spill response run or is an undefined run, no sites will appear in the list and the user will have to add each site manually.

Once the user is satisfied that all sites that were actually visited are listed they may click the 'Next' button to progress to the next step.

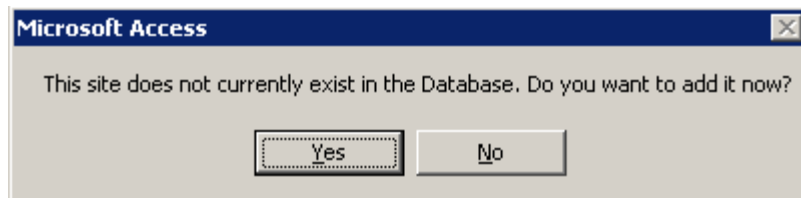
---

**Note: Spill response or new sites only**

For spill response sites, each site is assigned a unique 3-digit site number preceded by 'SR' (Spill Response). Since a spill response site may be new to the database, it may be necessary to add it to the database at this time.

To do this, simply type in the name of the new site into the box (for spill response use SR###, for Groundwater sites use GW###, for regular Surface Water sites use SW###, and for Department of Health sites use DH###, where each '#' represents a number) and press enter or click outside of the box. ***Please use uppercase letters only.***

A dialogue box should appear:



If the site is a new site to the database then you should click yes. If not, then you should click no and pick a site from the dropdown list.

fmShowSite : Form

Select Site Number: **DH038** (Lummi ID) Add New Site

General | Geopositioning Information | Site Photos | Site Characteristics

Site Number: DH038 Watershed:

SiteType: SW ☐ Nutrient / Metals / Hydrocarbons Site?

Lummi WQ Classification: Marine - Class AA (Extraordinary)

Old Identifiers:

Directions: From Gooseberry Point boat launch head northwest approximately 4 miles. Site is located on the east side of the southern portion of Sandy Point, slightly northwest of site 39.

Comments: Site is sampled six times a year by the Lummi Nation Water Resources Division staff. Bacterial analyses are completed by a local laboratory contracted by the Lummi Nation Natural Resource Department.

Sampling Purpose:

WQX Primary Type: Ocean

Fecal Coliform Trends Time Series of Site Data

Sorry. No Map Is Available for this Site Number

Select New Map DeLMap Database ID: 147

Delete Site Close

When the user clicks yes, the 'add new site' form appears with the name of the new site, the type of site, and establishment date already filled in automatically. The user must enter as much information about the site as possible.

For groundwater sites, additional information is also required such as the Well code, elevation (and metadata), stick-up height to the measuring point, as well as names of meters associated with the well and their physical location (Lat/long). These fields will appear on a wells tab (not visible in the screenshot above).

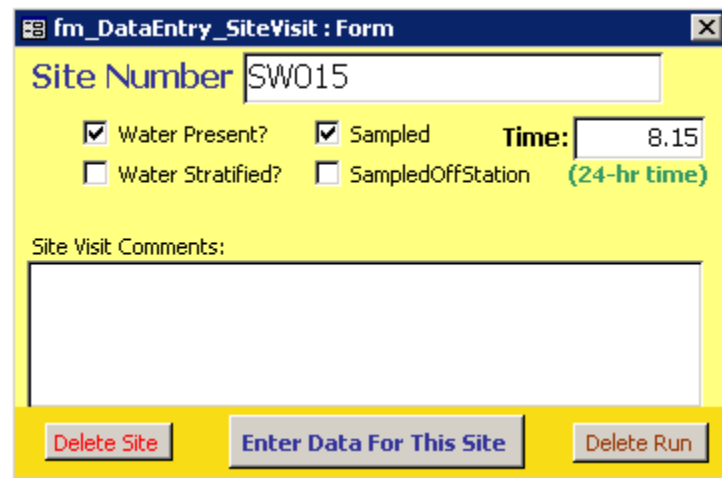
New sites and site information may also be added at a later time by clicking the 'Lookup Site Details' button on the main menu. However: **all site fields on the Storet information tab must be completely filled out before exporting data to Storet.**

When the new site has been created and all available information input, the user may click 'Save and Close' to return to the list of sites.

---

#### **STEP 4**

After the visited site list has been finalized and the user clicks 'Next', a new form will appear to store data about the site visit to the first site in the visited sites list.



In this case, the form is requesting information about the visit to site SW015.

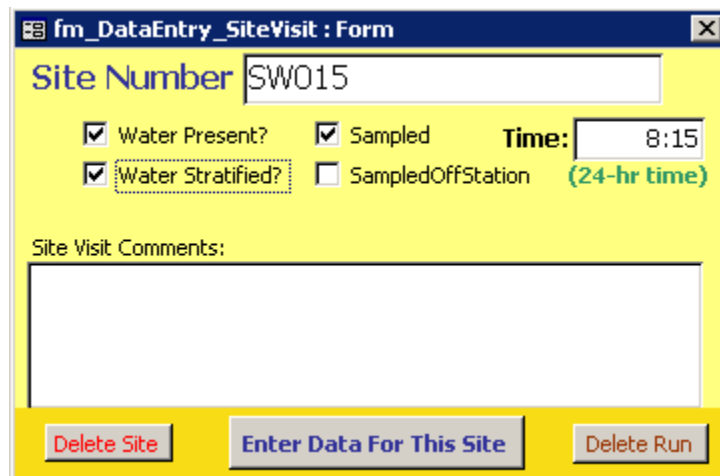
The user must enter a time for the visit before proceeding. The time should be entered as in 24-hour clock format. Note: You may enter 8:15 by typing 8.15 on the keypad and the box will convert the period into a colon automatically.

- 8:00 AM should be entered as 8:00 (8.00).
- 3:00 PM should be entered as 15:00 (15.00).

Furthermore, there are 4 check boxes that may need to be adjusted depending on conditions at the site during the visit.

The first checkbox, 'Water Present?' indicates whether there was sufficient water present at the site to sample. This may be necessary in summertime for some sites. If there is no water present, then the database will move on to the next site in the list once the user clicks 'Enter Data For This Site'. The default value for this box is that there is water present.

The next checkbox, 'Sampled', indicates that the site was actually sampled during the visit. If the user unchecks the box, then the database will move on to the next site in the list once the user clicks 'Enter Data For This Site'.



fm\_DataEntry\_SiteVisit : Form

Site Number SW015

☒ Water Present? ☒ Sampled Time: 8:15  
☒ Water Stratified? ☐ SampledOffStation (24-hr time)

Site Visit Comments:

Delete Site Enter Data For This Site Delete Run

The third checkbox indicates whether the water column was salinity-stratified at the site during the visit. If the user checks this box, then the database will automatically generate two records (in the next step) for each parameter that is normally sampled in both strata (upper and lower) and input the correct strata code for each. If the user leaves this unchecked, then only one record will be generated for each parameter and the code for a non-stratified site will be automatically used to identify the sampling strata.

If this is accidentally checked or unchecked erroneously, the user may manually remove or add records during the next step.

The last checkbox indicates that a sample was taken at the site but not at the usual position within the site.

Finally, a comment may be entered to further explain conditions at the site or reasons for not sampling the site during the visit.

Once the user is satisfied that all information is correct, and the time of the visit has been input, then they may click on 'Enter Data For This Site'.

Alternatively, the user may elect to cancel data entry for the whole run by clicking '*Delete Run*'. **This will delete any information previously entered for the run.**

If the user wishes to skip entering data for this site then they may click '*Delete Site*' which will delete any reference to this site being visited as part of this run. If the user wishes to add the site visit information to this run at a later date, they may do so by clicking on the *Add New Site To Existing Run* button on the main menu.

---

**Note: Groundwater sites only.**



Because well water-level information may need to be interpreted in light of instantaneous pumping rates and/or recovery times, it is necessary to have a record of what the pump status was at the time of arrival, whether the field crew modified the pump status during their visit, and precisely when changes to the pump were made, in addition to the specific time of each measurement.

For this reason, before moving on to entering the results, a new form will appear to record pump status during the site visit.

popfm\_DataEntry\_PumpStatus : Form

Please enter the Initial Pump Status, and subsequent changes to pump status along with the time of the change

Time: Pump Status: Status Changed?

	13:00	On	<input type="checkbox"/>
	13:05	Off	<input checked="" type="checkbox"/>
	13:15	On	<input checked="" type="checkbox"/>
		On Off	<input type="checkbox"/>

Close and Save

In this example, the pump was on at the time of arrival (1 PM), then switched off at 1:05 PM, then back on again at 1:15 PM.

---

## STEP 5

Once the site information has been entered, it is time to enter the actual results for each field parameter measured at the site.

Sample Taken Time	Parameter	Value	UnitID	Value Type	Lower Detect Limit	Upper Detect Limit	Equipment Used	Strata	Suspect Result?	Method
<input checked="" type="checkbox"/> 8:15	Air Temperature		Codes deg C				Thermometer - Ar	Not Applicable	<input type="checkbox"/>	Temperature
<input checked="" type="checkbox"/> 8:15	Flow		Codes cfs					Not Stratified	<input type="checkbox"/>	QAPP
<input checked="" type="checkbox"/> 8:15	Flow - Direction		Codes None					Not Stratified	<input type="checkbox"/>	QAPP
<input checked="" type="checkbox"/> 8:15	Oxygen - % Saturation		Codes %				YSI 556 Multimeter	Not Stratified	<input type="checkbox"/>	Dissolved Oxygen Using an I
<input checked="" type="checkbox"/> 8:15	Oxygen - Dissolved Field		Codes mg/l				YSI 556 Multimeter	Not Stratified	<input type="checkbox"/>	Dissolved Oxygen Using an I
<input checked="" type="checkbox"/> 8:15	pH - Field		Codes pH units				YSI 556 Multimeter	Not Stratified	<input type="checkbox"/>	pH
<input checked="" type="checkbox"/> 8:15	pH - Sample Temperature		Codes deg C				YSI 556 Multimeter	Not Stratified	<input type="checkbox"/>	Temperature
<input checked="" type="checkbox"/> 8:15	Salinity		Codes ppt				YSI 556 Multimeter	Not Stratified	<input type="checkbox"/>	Salinity in Water- Electrical C
<input checked="" type="checkbox"/> 8:15	Specific Conductivity - Field		Codes uS/cm				YSI 556 Multimeter	Not Stratified	<input type="checkbox"/>	Specific Conductance
<input checked="" type="checkbox"/> 8:15	Turbidity		Codes NTU				Hach 2100P Porta	Not Stratified	<input type="checkbox"/>	Turbidity by Nephelometry
<input checked="" type="checkbox"/> 8:15	Water Depth		Codes ft					Not Stratified	<input type="checkbox"/>	QAPP
<input checked="" type="checkbox"/> 8:15	Water Level (VG)		Codes ft					Not Stratified	<input type="checkbox"/>	QAPP
<input checked="" type="checkbox"/> 8:15	Water Temperature - In Situ		Codes deg C				YSI 556 Multimeter	Not Stratified	<input type="checkbox"/>	Temperature
<input checked="" type="checkbox"/> 8:15	Fecal Coliform		Codes cfu/100					Not Stratified	<input type="checkbox"/>	Delayed-Incubation Fecal Co
<input checked="" type="checkbox"/> 8:15	E. coli		Codes cfu/100					Not Stratified	<input type="checkbox"/>	Delayed-Incubation Fecal Co
<input checked="" type="checkbox"/> 8:15	Enterococcus		Codes cfu/100					Not Stratified	<input type="checkbox"/>	Standard Test Method for Er
<input type="checkbox"/>			Codes						<input type="checkbox"/>	

The database automatically creates records for each default parameter measured at the site, and fills in the time of the sample, the parameter name, the units of the measurement, the default equipment name for that parameter, the strata in which the measurement/sample was taken, and the name or reference for the method being used to measure the value.

At this point, the user must do the following tasks. (Each task is outlined in more detail below the list.)

1. Uncheck the 'Sample Taken' checkbox next to any of the automatically generated records that were not actually measured during the visit.
2. Add any parameters that were not in the default list but that were actually measured.



3. Make sure that all the automatically generated metadata (e.g., method, equipment) is correct
4. If the value is a summary statistic for several observations (for example, if the value is a mean value) then the user must input the correct statistic type in the *Value Type* field for that record.
5. Enter all **field measurement** results/values in the Value textbox. Samples that are sent to a lab may have their value and detection limit left blank (these can be entered at a later date).
6. If any measurements are marked as suspect in the field book, the user must check the '*Suspect Sample*' checkbox and enter the reason(s) for this suspicion in the form that will appear.
7. Add any mid-run calibrations or calibration checks.
8. Review the form for colored cells that might indicate a problem.

#### *Task 1*

*Uncheck the 'Sample Taken' checkbox next to any of the automatically generated records that were not actually measured during the visit.*

The Sample Taken checkbox indicates that a sample or measurement was, in fact, taken or measured during the visit to the site. Unchecking the box allows the database to erase that record when the form closes.

#### *Task 2*

*Add any parameters that were not in the default list but that were actually measured.*

Because the samplers may occasionally measure something not in the default list, or might make a replicate/duplicate measurement or sample, the user may have to manually enter new records.

This can be achieved by selecting a parameter name from the dropdown list in the green cell. **Always select the new parameter name first, before entering any values or units.**

fm\_DataEntry\_SiteResults : Form

SW015

Sample Taken Time	Parameter:	Value:	UnitID:	Value Type:	Lower Detect Limit:	Upper Detect Limit:	Equipment Used:	Strata:	Suspect Result?	Method
8:15	Air Temperature		Codes deg C				Thermometer - Ar	Not Applicable		Temperature
8:15	Flow		Codes cfs					Not Stratified		QAPP
8:15	Flow - Direction		Codes None					Not Stratified		QAPP
8:15	Oxygen - % Saturation		Codes %				YSI 556 Multimeter	Not Stratified		Dissolved Oxygen Using an I
8:15	Oxygen - Dissolved Field		Codes mg/l				YSI 556 Multimeter	Not Stratified		Dissolved Oxygen Using an I
8:15	pH - Field		Codes pH units				YSI 556 Multimeter	Not Stratified		pH
8:15	pH - Sample Temperature		Codes deg C				YSI 556 Multimeter	Not Stratified		Temperature
8:15	Salinity		Codes ppt				YSI 556 Multimeter	Not Stratified		Salinity in Water- Electrical C
8:15	Specific Conductivity - Field		Codes uS/cm				YSI 556 Multimeter	Not Stratified		Specific Conductance
8:15	Turbidity		Codes NTU				Hach 2100P Porta	Not Stratified		Turbidity by Nephelometry
8:15	Water Depth		Codes ft					Not Stratified		QAPP
8:15	Water Level (VG)		Codes ft					Not Stratified		QAPP
8:15	Water Temperature - In Situ		Codes deg C				YSI 556 Multimeter	Not Stratified		Temperature
8:15	Fecal Coliform		Codes cfu/100					Not Stratified		Delayed-Incubation Fecal Co
8:15	E. coli		Codes cfu/100					Not Stratified		Delayed-Incubation Fecal Co
8:15	Enterococcus		Codes cfu/100					Not Stratified		Standard Test Method for Er

Once you select a parameter, the default unit for that parameter will be automatically filled in, and some of the adjacent metadata cells will change color to pink to notify the user that data is required in that cell.

If the field measurement was recorded in different units than the default unit, the user should first input the result value, then select the correct units for the measurement from the drop-down menu. The database will automatically convert the measurement into the default unit unless the units are not compatible (eg, converting a distance unit (like feet) into a concentration unit (like mg/L) is not possible), or if the database doesn't know how to convert the two units. If the database cannot convert the units, the user will be requested to convert the measurement manually and input the new value (using the default units).

Im\_DataEntry\_SiteResults : Form

SW015

Sample Taken Time:	Parameter:	Value:	UnitID:	Value Type:	Lower Detect Limit:	Upper Detect Limit:	Equipment Used:	Strata:	Suspect Result?	Method
8:15	Air Temperature		Codes deg C				Thermometer - Ar	Not Applicable		Temperature
8:15	Flow		Codes cfs					Not Stratified		QAPP
8:15	Flow - Direction		Codes None					Not Stratified		QAPP
8:15	Oxygen - % Saturation		Codes %				YSI 556 Multimeter	Not Stratified		Dissolved Oxygen Using an I
8:15	Oxygen - Dissolved Field		Codes mg/l				YSI 556 Multimeter	Not Stratified		Dissolved Oxygen Using an I
8:15	pH - Field		Codes pH units				YSI 556 Multimeter	Not Stratified		pH
8:15	pH - Sample Temperature		Codes deg C				YSI 556 Multimeter	Not Stratified		Temperature
8:15	Salinity		Codes ppt				YSI 556 Multimeter	Not Stratified		Salinity in Water- Electrical C
8:15	Specific Conductivity - Field		Codes uS/cm				YSI 556 Multimeter	Not Stratified		Specific Conductance
8:15	Turbidity		Codes NTU				Hach 2100P Porta	Not Stratified		Turbidity by Nephelometry
8:15	Water Depth		Codes ft					Not Stratified		QAPP
8:15	Water Level (VG)		Codes ft					Not Stratified		QAPP
8:15	Water Temperature - In Silt		Codes deg C				YSI 556 Multimeter	Not Stratified		Temperature
8:15	Fecal Coliform		Codes cfu/100					Not Stratified		Delayed-Incubation Fecal Co
8:15	E. coli		Codes cfu/100					Not Stratified		Delayed-Incubation Fecal Co
8:15	Enterococcus		Codes cfu/100					Not Stratified		Standard Test Method for Er
8:15	Specific Conductivity - Field		Codes uS/cm							Specific Conductance
			Codes							

If any cells are colored red then you must input a value into that cell. As the red cells are populated with data, their color should revert to yellow.

If any are colored white AND the parameter is not a lab sample then you must enter a value before proceeding.

### Task 3

*Make sure that all the automatically generated metadata (e.g., method, equipment) is correct.*

This requires the user to verify that the metadata generated for each record is correct. For example, changes may be needed if an unusual analysis method was used in place of the regular method, or if a different item of equipment was used for a particular measurement.

#### *Task 4*

*If the value is a summary statistic for several observations (for example, if the value is a mean value) then the user must input the correct statistic type in the Value Type field for that record.*

The Value Type cell should be left blank unless the measurement is a summary statistic such as a mean, maximum, minimum etc. The user must fill in this field wherever summary statistics are indicated.

#### *Task 5*

*Enter all **field measurement** results/values in the Value textbox. Samples that are sent to a lab may have their value and detection limit left blank if not yet available (these can be entered at a later date).*

This is the point at which the user enters the actual values for each measured parameter. Detection limits are not typically required for field-measured parameters, but if lab results are available and detection limits are listed then the corresponding detection limit should also be entered at the same time as the value is entered. If lab results are not available at the time of data entry, they may be left blank and entered later in a different section of the database.

The form has two fields for entering detection limits: Lower Detection Limit and Upper Detection Limit. The Lower Detection Limit is equivalent to the 'PQL' and should be entered wherever a result has been recorded as '<x', where x represents a number. The data entry convention in this case would be to use a value of '0', and a **Lower** Detection Limit of 'x' (subsistuting the x for whatever number it represents).

For example, an *E.coli* result of '<1' would be entered as a Value of 0, and a Lower Detection Limit of 1.

By contrast, in some cases the result may have been too large for the field crew or the lab to measure with the equipment available. In such cases, the result will likely be recorded as '>x', where x again represents a number.

In this case, the data entry convention will be to enter the value as 'x', and the **Upper** Detection Limit as also 'x'.

For example, if the field crew are measuring secchi depth at a site that is only 30cm deep, and the clarity of the water allows them to see all the way to the bottom, then the maximum possible reading for the secchi depth is limited by the depth of water at the site instead of the clarity of the water itself. In this case, the Value entered for Secchi Depth would be 30 (cm) and the Upper Detection Limit would also be 30 (cm).

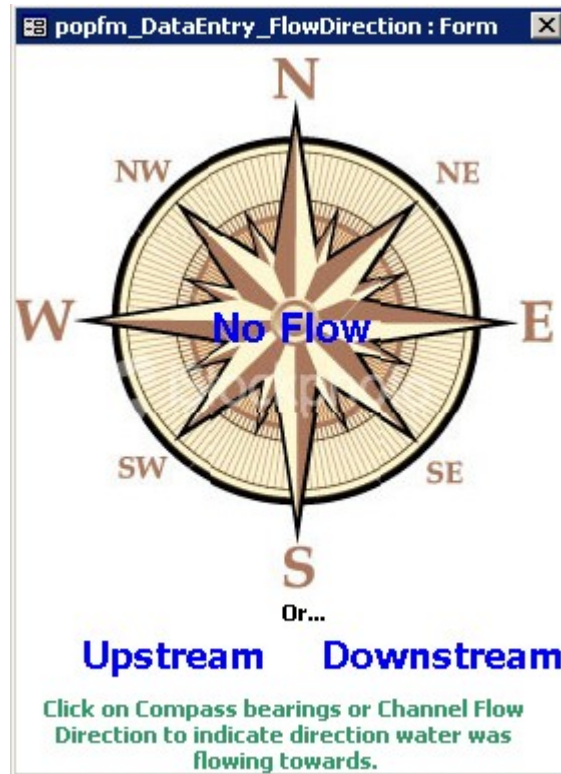
The user should only ever enter the Lower or the Upper Detection Limit, not both.

For some parameters the user may need to enter codes, or convert from one unit of measurement to another. To do this, the user may click on the 'Code' button next to the value.

These parameters are listed below:

- Flow Direction

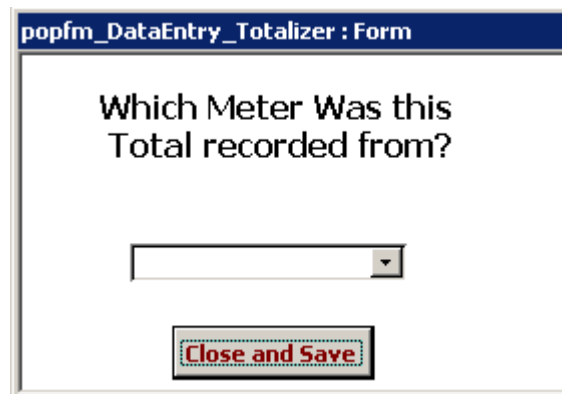
Because a numerical value is required in the value field, it is not possible to enter text descriptions such as 'Downstream' or 'South-East'. Instead, pre-defined numerical codes have been created to represent each of the possible options. To enter the correct code, either click on the code button and a form will open or click inside the value box and the same form will open.



The user may then click on either one of the compass bearings shown, or on the blue text. The form will then close automatically and input the correct code into the value box. If the user closes the form without selecting a flow direction, the value 0 will be entered into the value cell, which has no corresponding code in the database.

- Totalizer

The totalizer is like an odometer reading that records cumulative water volume pumped out through a water meter. Because different meters are present on different wells, and some wells may have more than one meter, it is necessary to know which meter a totalizer value was recorded from. Whenever the user enters a totalizer value in the Value box a form will appear that requires the user to identify the meter.



The user must select the correct meter from the list and then click 'close and save'.

**Note:** If the meter name does not appear in the drop-down box, then the user must click the 'Add New Meter' button, and specify a unique name for the meter. The usual naming convention for meters is to use the numerical part of the site number, followed by a period, then the next available unused number.

- Water Level - Pump On
- Water Level - Pump Off

When the field crew measure water level they use a probe/cable with pre-marked increments on it. They then measure the distance from the closest increment mark to their measuring point. The closest increment mark may be further away than the measuring point, or between the measuring point and the water. Then

they measure the distance from their measuring point to the reference elevation point (usually the top of the sanitary seal). Finally, they may adjust for cable stretch.

If the user clicks on the 'code' button next to either of these parameters a calculation form opens up that will help the user determine the correct decimal measurement.

The screenshot shows a software form titled "popfm\_DataEntry\_WaterLevel: Form". It contains three main sections, each with a yellow header:

- Initial Cable Measurement:** This section includes an "Increment:" label followed by a two-digit text box. To its right is a large grey button with a "+" sign. Further right is a "Feet Inches:" label followed by two text boxes (one for feet, one for inches) and a small checkbox with a diagonal line through it.
- Cable Stretch:** This section includes an "Inches:" label followed by a two-digit text box and a small checkbox with a diagonal line through it.
- Decimal Feet:** This section includes a green button labeled "Click to Compute", a single-line text box, and a red button labeled "Close and Save".

The user inputs the numbers into the appropriate boxes.

For measurements where the field personnel records the nearest increment, then the distance from that increment to the measuring point, the user uses the top text boxes to input the relevant data. The large '+' button can be clicked to toggle to a '-' sign, which is used as a mathematical operator in the calculation. This simply indicates whether the distance between the measuring point and the water surface is greater than the cable increment (+), or less than the cable increment (-). If the cable has become stretched, the user should input the known stretch value to improve the accuracy of the final result.



popfm\_DataEntry\_WaterLevel : Form

**Initial Cable Measurement**

Increment:   Feet Inches:

**Cable Stretch**

Inches:

**Decimal Feet**

In this example, the closest cable increment was 135 feet. The increment was  $2\frac{1}{4}$  inches beyond the measuring point. And the cable is known to have stretched by c.  $\frac{1}{2}$  inch. When the user clicks 'Click to Convert' the database calculates the distance between the measuring point and the water level.

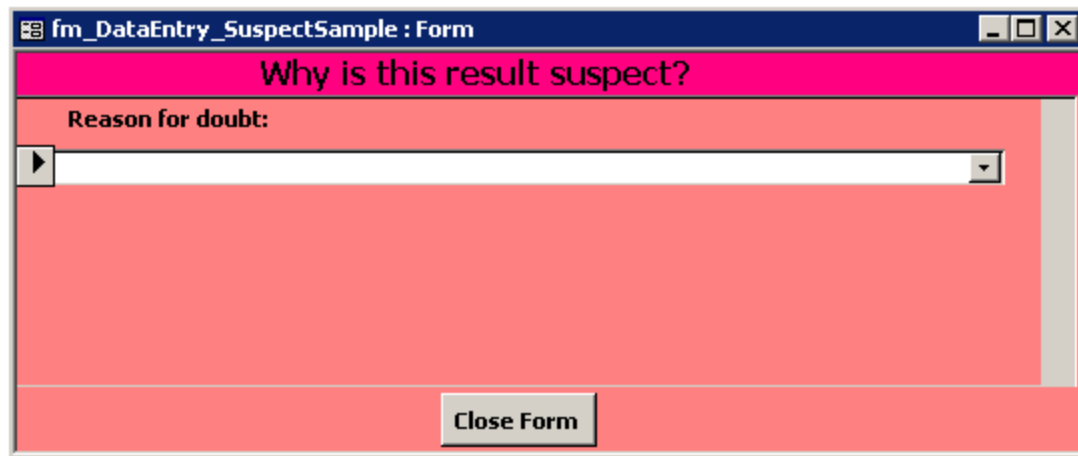
If the user already knows the correct decimal value for the measurement, they may simply enter it into the bottom text box.

When the user is satisfied, they click on 'Close and Save' and the result of the calculation is automatically entered into the value box on the main form.

## Task 6

*If any measurements are marked as suspect in the field book, the user must check the 'Suspect Sample' checkbox and enter the reason(s) for this suspicion in the form that will appear.*

If a measurement or sample value may be erroneous or unreliable it must be marked as suspect by checking the 'Suspect Sample' checkbox. When this happens, a form will open requesting details about why the measurement was marked as suspect.



fm\_DataEntry\_SuspectSample : Form

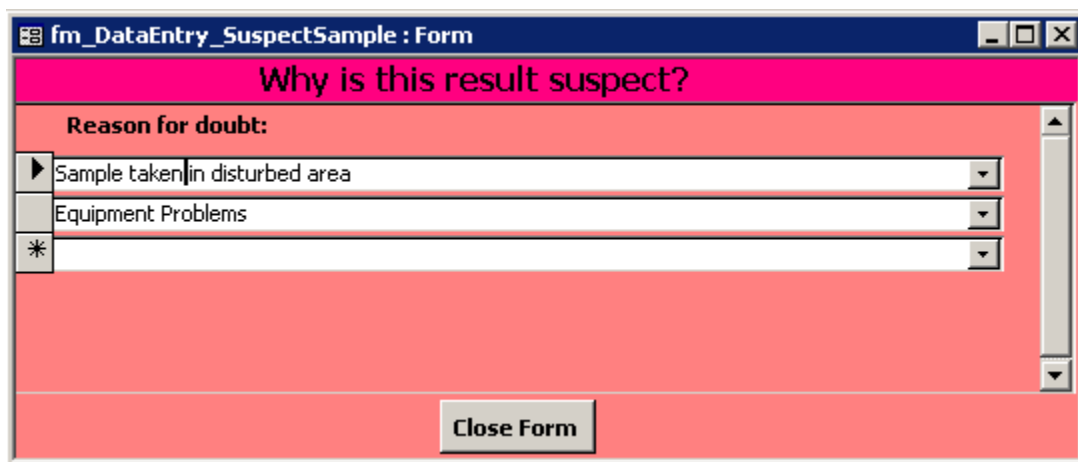
**Why is this result suspect?**

Reason for doubt:

▶

Close Form

The user should carefully evaluate all the previously defined reasons listed in the drop down box and chose the one(s) that best fit the scenario.



fm\_DataEntry\_SuspectSample : Form

**Why is this result suspect?**

Reason for doubt:

▶ Sample taken in disturbed area

Equipment Problems

\*

Close Form

### *Task 7*

#### **Add any mid-run calibrations or calibration checks.**

Click on the 'Cal' button next to the parameter that was being calibrated or calibration checked to open the calibration form. Input whether the event was a calibration or calibration check, enter the reference and equipment values and attribute information (if any). Click Save and Close.

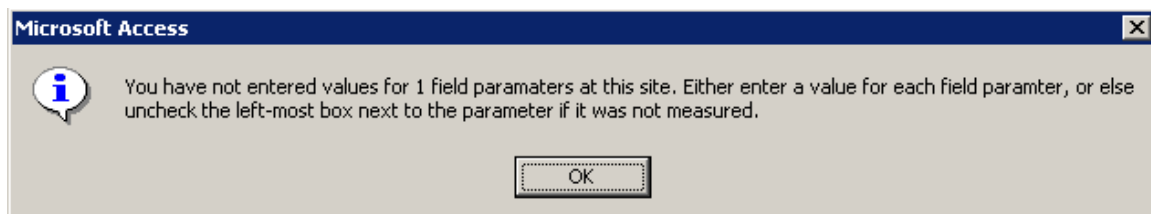
### *Task 8*

#### **Review the form for colored cells that might indicate a problem.**

Once all the results have been entered, the user should review the form for cells/boxes that are colored pink and enter data into those required boxes. Blue cells indicate duplicate samples and should be checked to be sure that the correct Result Category is entered.

White cells indicate that values should (lab samples; if results are available) or must (field measurements) be entered. If a field measurement has no value available, then you must uncheck the Sample 'Taken' checkbox for that record.

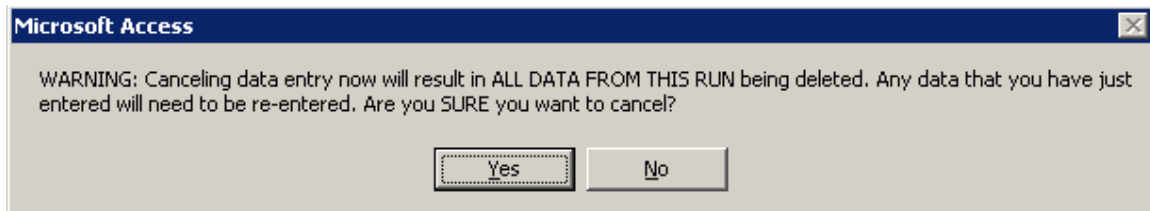
Once this review is complete, the user may click on 'Continue Data Entry. If any field measurements still require a value, and the 'Sample Taken' checkbox is checked, an error message will appear:



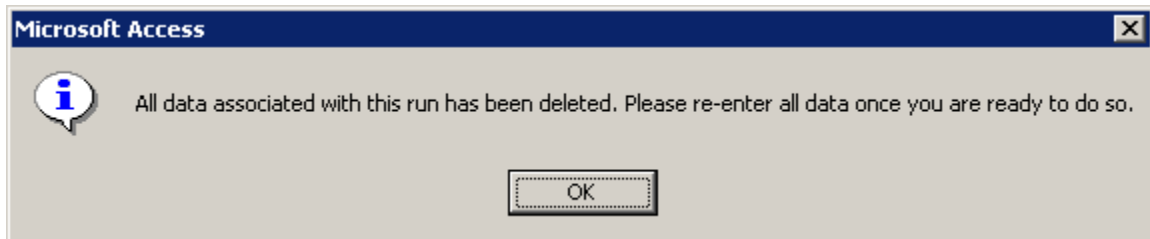
The user must take the corrective actions detailed in the dialogue box before progressing to entering site visit information for the next site.

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**WARNING:** If you cancel the data entry process by clicking on the Cancel buttons in Steps 4 or 5 then you will delete all data that has already been entered for that sample run. This restriction exists to avoid double entry of data in 'partly' entered runs. The database will warn you whenever you click on the Cancel button:



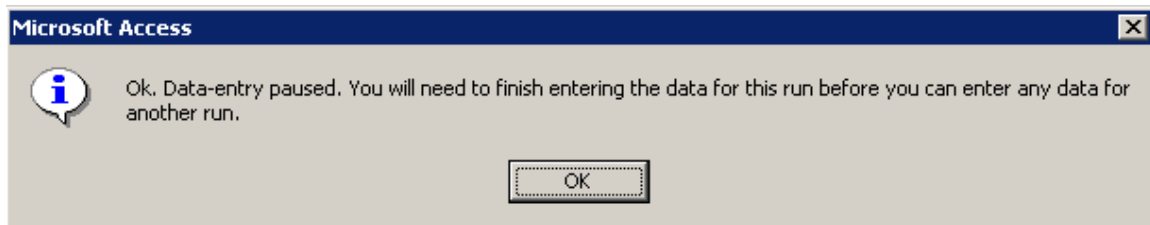
If the user then selects no, then the cancel action will be aborted. If the user confirms that they wish to cancel data entry, then the database will delete the pertinent data and confirm that the data was deleted before terminating the data entry process and returning the user to the main menu.



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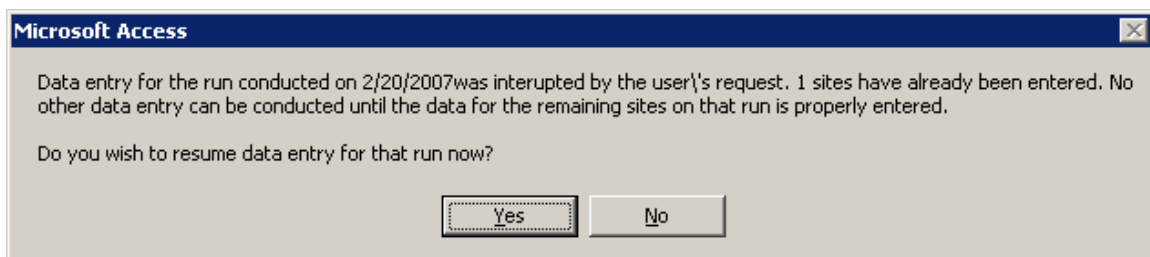
Once the user has saved the data entered in Step 5 (by clicking on the 'Continue Data Entry' button) the database will repeat steps 4 and 5 for the next site in the visited sites list shown in step 3.

As another alternative, the user may choose to temporarily stop the data entry process at this stage. To do this, the user clicks on the 'Pause Data Entry' button instead of the 'Continue Data Entry' button. If the data entered into the results form is acceptable, the following message should appear.



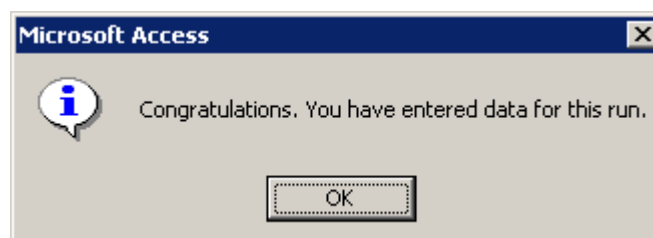
The user will then be returned to the main menu.

If the user wishes to resume the data entry process, they click on the 'Enter Water Quality Data by Run' button on the main form as they would for entering a new run. However, the database will offer the user the choice to resume entering data for the interrupted run or return to the menu.



The user may close the database after pausing data-entry, and resume the data entry process in another session. Data for other runs may not be entered until the user has completely finished entering data for the interrupted run.

Finally, once the user has input all data for all sites visited on the run, the database will terminate the data entry process with a dialogue box:



This indicates that all data for the run has been safely entered and saved in the database. The user will then be returned to the main menu.

QA: Data-Entry Review Form									
Run Date: 1/19/2007		Site Number: DH044		Date Entered: 1/19/2007					
Sample Time	Parameter	Value	Units	Duplicate	Prepmt Sample	Unusual Equipment	Unusual Method	Verified Entry	
2-15	Color		cu/100	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2-15	Water Temperature - pH Field	10	deg C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2-15	Water Temperature - h Salu	10	deg C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2-15	Turbidity	25	NTU	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2-15	Water Depth	25	ft	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2-15	Specific Conductivity - Field	150	uS/cm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2-15	Salinity	24	ppt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2-15	Seiche Depth	50	cm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2-15	pH - Field	7.5	None	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2-15	Flow	2	cfs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2-15	Fecal Coliform		cu/100	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2-15	Enterococcus		cu/100	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2-15	Percent Saturation	92	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2-15	Dissolved Oxygen	3	mg/l	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2-15	Flow Direction	W	None	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Data Checked by: \_\_\_\_\_ Date: \_\_\_\_\_

If no printer is available, the user may also print out the QA review form at a later time by clicking the 'Print Data-Entry QA Report' button on the main menu, and selecting the appropriate run from the list that will appear.

If the QA review process discovers a flaw in the entered data, the faulty information can be changed by clicking 'View sampling dates' button (on the main menu). Follow the directions on pages 61-64 of this guide to access the data for the relevant date and site number.

If the problem is an erroneous value in a record then the user may replace the wrong value with the correct one.

If the problem is a missing result, then the user may click the 'Add Value' button at the bottom of the form to add a new line of information. (A smaller form will appear to enter the new information in)

If the problem is a result entered into the database that was not actually taken in the field, then the user may delete the extraneous record by left clicking on the grey area to the left of the bad record. (The grey area selected should turn black with a white arrow.) The user can then press 'delete' on their keyboard and the record should be removed.

## ‘Enter Lab Results’

In the event that lab results arrive after the field data has already been entered, it becomes necessary to locate the records created during that data entry process and input the newly arrived values. When the user clicks on this button on the main menu, a form appears to help locate those records.

The screenshot shows a software window titled "fm\_LABRESULTS\_DataEntry : Form". The window has a red header bar containing the following labels: "Collection Date:", "Site Number:", "Run Date", "Parameter:", "Value:", "Units:", "Lower Detection Limit:", "Upper Detection Limit:", and "Suspect Sample". Below the header bar is a large pink area for data entry. A "Save and Close" button is located at the bottom center of the form.



To find the records, the user must input the date that the run occurred into the 'Collection Date' box. Clicking the Collection date box will open a calendar that is used to select that run date.

**fm\_LABRESULTS\_DataEntry : Form**

Collection Date: 3/1/2007      Site Number:  

Site Number:	Run Date	Parameter:	Value:	Units:	Lower Detection Limit:	Upper Detection Limit:	Suspect Sample
SW008	3/1/2007	Enterococcus		cfu/100ml			<input type="checkbox"/>
SW008	3/1/2007	Fecal Coliform		cfu/100ml			<input type="checkbox"/>
SW008	3/1/2007	E. coli		cfu/100ml			<input type="checkbox"/>
SW009	3/1/2007	Enterococcus		cfu/100ml			<input type="checkbox"/>
SW009	3/1/2007	Fecal Coliform		cfu/100ml			<input type="checkbox"/>
SW009	3/1/2007	E. coli		cfu/100ml			<input type="checkbox"/>
*							<input type="checkbox"/>

**Save and Close**

If necessary, select the site number from the 'Site Number' dropdown list to limit the results to just the site you wish to enter lab results from.

fm\_LABRESULTS\_DataEntry : Form

Collection Date: 3/1/2007 Site Number: SW009

Site Number:	Run Date	Parameter:	Value:	Units:	Lower Detection Limit:	Upper Detection Limit:	Suspect Sample
SW009	3/1/2007	Enterococcus		cfu/100ml			<input type="checkbox"/>
SW009	3/1/2007	Fecal Coliform		cfu/100ml			<input type="checkbox"/>
SW009	3/1/2007	E. coli		cfu/100ml			<input type="checkbox"/>
*							<input type="checkbox"/>

Save and Close

Once the user is sure that the correct information is shown, they may enter the actual result into the value field and the appropriate detection limit into the relevant detection limit field. The data-entry convention for detection limits is the same as noted on pages 33 and 34. As noted in the previous section, if the result is suspect for some reason, the user must check the Suspect Sample box and input the reasons for the suspicion into the form that opens.

The user can retrieve other records by altering the dates and sites used at the top of the form. When all the information has been entered, the user returns to the main menu by clicking 'Save and Close'.

## ‘Add New Site To Existing Run’

This button allows the user to enter data for a site that was sampled during a run that has already been entered into the database without the data from the new site. This button does not allow the user to edit previously entered data, or to add new data for sites that have already been entered as part of a run.

The most likely situation when this button might be used will be if the user forgets to add a site to the list of visited sites in the initial stages of data-entry for a run (*fm\_DataEntry\_SitesVisited*), or if they erroneously uncheck the ‘visited’ box next to the site.

When the user clicks this button, a form will open that lists all runs that have been entered into the database so far. The user must find the run that they have additional data for and click the ‘Select This Run’ button next to it.

Date:	Run Type:	
3/2/2007	SW- Floodplain West (FPW)	Select this Run
3/1/2007	SW- Floodplain West (FPW)	Select this Run
2/27/2007	SW- Floodplain West (FPW)	Select this Run
2/23/2007	SW- Floodplain West (FPW)	Select this Run
2/22/2007	SW- Floodplain West (FPW)	Select this Run
2/21/2007	SW- Floodplain West (FPW)	Select this Run
2/20/2007	SW- Floodplain West (FPW)	Select this Run
2/20/2007	SW- Floodplain East (FPE)	Select this Run

The user will then need to input the site number of the new site(s) that they have data for that have not already been entered into the database. Following that, the user will be prompted to input the actual data for the new site(s) in the same way that data is entered during normal data-entry.

## ‘Setup Run Defaults’

The water resources database uses pre-defined information about runs to save the user from having to repetitively select sites, equipment, and parameters that are quite predictable. This button allows the user to review the default sites, default sampling conventions (lists of parameters to be sampled at each site on the run), and default arrays of equipment items to be taken on each run. It is also possible for the user to create new named runs, new sampling conventions, and new equipment arrays.

The screenshot shows a software window titled "fm\_AddNewRun : Form". The window is divided into several sections for configuring a new run. At the top, the "Run Name" is set to "SW- Floodplain East (FPE)". Below this, there are three main panels:

- Default Parameters Measured During This Run:** This panel includes a "Convention Name" dropdown set to "FPE & FPW". Below it is a table of parameters with checkboxes to select which ones to sample. The "Sample only in Nut-Hydr-Metal runs?" column has checkboxes for various parameters, with "Alkalinity", "Ammonia", "Biochemical Oxygen Demand", "Nitrate", "Nitrite", "Total Kjeldahl Nitrogen", "Orthophosphate", and "Total Phosphorus" all checked.
- Default Equipment Taken On This Run:** This panel includes an "Equipment Array Name" dropdown set to "SW\_Test1". Below it is a table of equipment items with checkboxes to select which ones to take. The "Take only on Nut-Hydr-Metal runs?" column has checkboxes for various equipment items, with "Hach 2100P Portable Turbidimeter, Hach, 210", "Handheld pH/mV/Temperature Meter, ASI, IQ1", "Oxyguard Handy Mk.III Portable DO Meter, Ox", "Thermometer - Armored, non-toxic, liquid-in-gl", and "WTW 330 with TetraCon 352 Probe, TetraCon," all checked.
- Default Sites Visited On This Run:** This panel shows a list of sites with dropdown menus for selection. The sites listed are SW015, SW016, SW017, SW051, SW052, SW055, SW056, SW059, and SW072. There is also a "\*" button at the bottom of the list.

At the bottom of the window, there are three buttons: "Add New Run", "Return to Menu", and "Delete Run".

After clicking the ‘Setup Run Defaults’ button on the main menu, a new form will open up as above showing the details for the first named run in the database. The list of parameters in a convention, or equipment items in an array, cannot be edited from this form. However, the user can change the sampling convention associated with the run, change the equipment array associated with the run, and modify the list of sites visited during a run.

To view each run, the user can click on the navigation buttons (circled in red below) to move between named runs.

fm\_AddNewRun : Form

2 Run Name: SW- Floodplain West (FPW)

Default Parameters Measured During This Run:

Convention Name: FPE & FPW  
(To add a new Sampling Convention type in new name)

Parameter: Sample only in Nut-Hydr-Metal runs?

Air Temperature	<input type="checkbox"/>
Water Temperature - In Situ	<input type="checkbox"/>
Salinity	<input type="checkbox"/>
Specific Conductivity - Field	<input type="checkbox"/>
Flow Direction	<input type="checkbox"/>
Dissolved Oxygen	<input type="checkbox"/>
Flow	<input type="checkbox"/>
pH - Field	<input type="checkbox"/>
Water Depth	<input type="checkbox"/>
Turbidity	<input type="checkbox"/>
Fecal Coliform	<input type="checkbox"/>
E. coli	<input type="checkbox"/>
Enterococcus	<input type="checkbox"/>
Water Temperature - pH Field	<input type="checkbox"/>
Alkalinity	<input checked="" type="checkbox"/>
Ammonia	<input checked="" type="checkbox"/>
Biochemical Oxygen Demand	<input checked="" type="checkbox"/>
Nitrate	<input checked="" type="checkbox"/>
Nitrite	<input checked="" type="checkbox"/>
Total Kjeldahl Nitrogen	<input checked="" type="checkbox"/>
Orthophosphate	<input checked="" type="checkbox"/>
Total Phosphorus	<input checked="" type="checkbox"/>

Default Equipment Taken On This Run:

Equipment Array Name: SW\_Test1  
(To add a new array of default equipment: type in new name)

Equipment: Take only on Nut-Hydr-Metal runs?

Hach 2100P Portable Turbidimeter, Hach, 210	<input type="checkbox"/>
Handheld pH/mV/Temperature Meter, ASI, IQ1	<input type="checkbox"/>
Oxyguard Handy Mk III Portable DO Meter, Ox	<input type="checkbox"/>
Thermometer - Armored, non-toxic, liquid-in-gla	<input type="checkbox"/>
WTW 330 with TetraCon 352 Probe, TetraCon,	<input type="checkbox"/>

Default Sites Visited On This Run:

SW003
SW008
SW009
SW010
SW011
SW012
SW013
SW014
SW051
SW053
SW058
*

Navigation buttons: ◀ ▶ Add New Run Return to Menu Delete Run

### Creating new named-Runs

To add a new run, click on the 'Add New Run' button and input a unique name into the purple 'Run Name' box. It is strongly recommended that the new run name begin with a prefix that denotes whether the run is primarily a surface water run (SW-), a groundwater run (GW-), Spill Response (SR-) or Other (Other-). This will help keep the runs organized in the dropdown lists where the names appear.

fm\_AddNewRun : Form

27 Run Name: New Name Here

Default Parameters Measured During This Run: Default Equipment Taken On This Run: Default Sites Visited On This Run:

◀ ▶ Add New Run Return to Menu Delete Run

Once the name has been entered, the form should appear as below.

fm\_AddNewRun : Form

27 Run Name: New Name Here

Default Parameters Measured During This Run: Default Equipment Taken On This Run: Default Sites Visited On This Run:

Convention Name (To add a new Sampling Convention type in new name) Equipment Array Name (To add a new array of default equipment type in new name)

Parameter: Sample only in Nut-Hydr-Metal runs? Equipment: Take only on Nut-Hydr-Metal runs?

◀ ▶ Add New Run Return to Menu Delete Run

The user must now choose a default sampling convention and a default equipment array from the dropdown lists (or create new conventions/arrays

following the directions given further below). Then the user can start adding sites to the list at the right of the form (circled in red on the following image).

fm\_AddNewRun : Form

Run Name: New Name Here

Default Parameters Measured During This Run:

Convention Name: (To add a new Sampling Convention type in new name)

Parameter: Sample only in Nut-Hydr-Metal runs?

Default Equipment Taken On This Run:

Equipment Array Name: (To add a new array of default equipment: type in new name)

Equipment: Take only on Nut-Hydr-Metal runs?

Default Sites Visited On This Run:

Add New Run Return to Menu Delete Run

Once the user is satisfied with the default parameters for the new run, they can return to the main menu by clicking 'Return to Main Menu'.

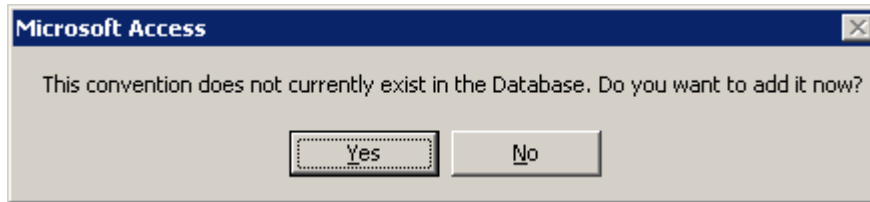
### *Changing default Sampling Conventions*

The user can use the dropdown list in the 'Convention Name' box to select a different sampling convention. When the user selects a new convention from the list, the form will update itself to show the new list of default parameters now associated with that run.

If the user wishes to use a different sampling convention than any that are already in the database, the user may create a new sampling convention.

### *Creating a new Sampling Convention*

To create a new sampling convention, the user must type the name of the new convention into the 'Convention Name' box. A dialogue box should appear:



The user should click yes if they wish to create a new convention, or no if they want to select from the existing list of conventions.

Once the user has clicked yes, a new form will appear that will allow the user to create a new list of parameters that will collectively be known by the new convention's name.

A form titled "fm\_AddNewConvention : Form" with a blue border. At the top, it says "Input New Convention Name". Below this, there is a text box containing "32" and another text box containing "TESTNAME". Below these, there is a section with a grey background. On the left, it says "Parameter:" in yellow. To the right, it says "Sample only in Nut-Hydr-Metal runs?" in yellow. Below this text, there is a dropdown menu and a checkbox. At the bottom of the form, there is a button labeled "Close Form".



To add new parameters to the list, the user simply selects the name of each parameter from the dropdown list. After each addition, a new line will appear below the last entry thereby allowing the user to add as many parameters as they desire.

fm\_AddNewConvention : Form

Input New Convention Name

33 TESTNAME

Parameter: Sample only in Nut-Hydr-Metal runs?

Arsenic	<input type="checkbox"/>
Chlorophyll a	<input type="checkbox"/>
	<input type="checkbox"/>
Chloride - Field	
Chloride - Lab	
Chlorophyll a	
Chromium	
Coliform	
Conductance	
Copper	
Diesel Range Plus	

Close Form

The checkbox next to each parameter should only be checked if the parameter is to be sampled only during periodic (quarterly?) runs that sample additional parameters such as metals, nutrients, and hydrocarbons. If this box is checked, the parameter will only be included on runs that are identified as Metal/Nutrient/Hydrocarbon runs, and only at sites that have the 'Nutrient/Metals/Hydrocarbons' checkbox checked (on the site information form).

Leave this box unchecked if you wish the parameter to always appear for each site.

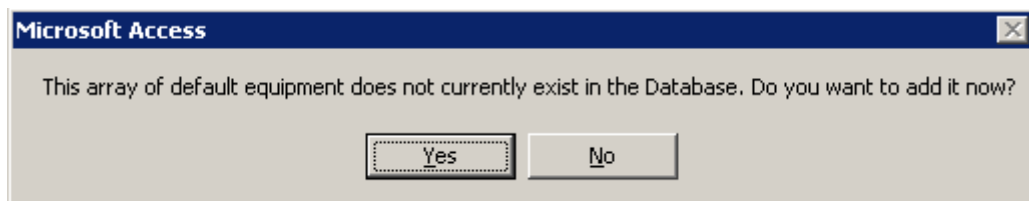
### *Changing default Equipment Arrays*

The user can use the dropdown list in the 'Equipment Array Name' box to select a different list of default equipment (equipment array). When the user selects a new array from the list, the form will update itself to show the new list of default equipment that is now associated with that run.

If the user wishes to use a different equipment array than any that is already in the database, the user may create a new equipment array.

### *Creating a new Equipment Array*

To create a new equipment array, the user must type the name of the new array into the 'Equipment Array Name' box. A dialogue box should appear:



The user should click yes if they wish to create a new array of equipment, or no if they want to select from the existing list of arrays.

Once the user has clicked yes, a new form will appear that will allow the user to create a new list of equipment that will collectively be known by the new array's name.

fm\_AddNewConvention : Form

Input New Convention Name

34 TESTNAME

Parameter: Sample only in Nut-Hydr-Metal runs?

Close Form

To add new items of equipment to the list, the user simply selects the name of each item from the dropdown list. After each addition, a new line will appear below the last entry thereby allowing the user to add as many items as they desire.

fm\_AddNewDefaultEquipmentArray : Form

Equipment Array Name: TEST

Take only on Nut-Hydr-Metal runs?

YSI S-C-T, YSI, Model 30 ☐

WTW 330 with TetraCon 352 Probe, TetraCon, LF330 ☐

YSI S-C-T, YSI, Model 30 ☐

Oxyguard Handy Mk III Portable DO Meter, Oxyguard, Mk III ☐

Oxyguard Handy Gamma Portable DO Meter, Oxyguard, Gamma ☐

Handheld pH/mV/Temperature Meter, ASI, IQ150 Meter, Model 35 electrode, Model T11 probe ☐

Hach 2100P Portable Turbidimeter, Hach, 2100P ☐

Waterline Envirotech 300-ft Olympic Well Probe, Waterline Envirotech, Solinst 300-ft Well Probe, Solinst, ☐

Close Form

The checkbox next to each item should only be checked if the equipment is to be taken along only during periodic (quarterly?) runs that sample additional parameters such as metals, nutrients, and hydrocarbons. If this box is checked, the equipment item will only be included on runs that are identified as Metal/Nutrient/Hydrocarbon runs.

Leave this box unchecked if you wish the item to always be included in the list of equipment taken on the run.

## ‘View/Add Parameters’

fmShowParameters : Form

Parameter Name: Air Temperature

Default Units: deg C

☐ Analyzed in Lab?

☐ If water is Stratified, is this measured in both strata?

Minimum Value: -10 Max Value: 40

**Required Storet Information**

Characteristic Name: Temperature, air

Default Method: QAPP

Matrix: Air

Fraction:

Default Detection Limit:

Navigation buttons: First, Previous, Next, Last

Buttons: Add New Parameter, Return To Menu

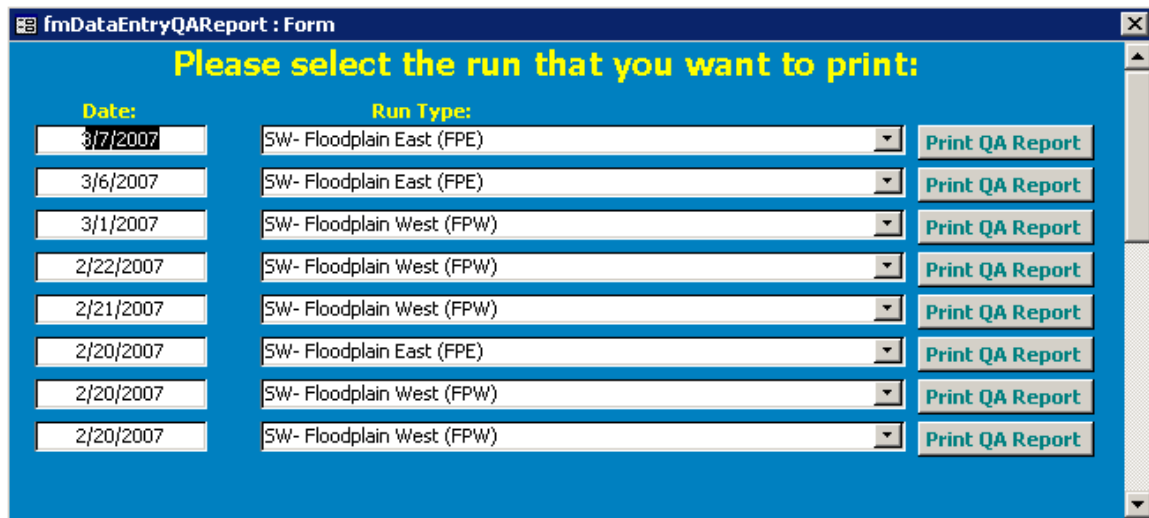
The user may choose to view information about each parameter used in the database by clicking on the ‘View/Add Parameter’ button on the main menu. The form shown above will open and the user can move between parameters by clicking on the forward or backward arrow buttons at the bottom of the form. (The smaller arrow buttons to the left and right of the main arrow button skip to the first or last parameter in the database respectively).

The user can also create a new parameter by clicking ‘Add New Parameter’ and filling in all the boxes where possible.


**Note:** It is essential that a default unit be assigned to any new parameter. It is also essential to check the Analyzed in Lab checkbox if the parameter is measured in a laboratory rather than the field.

## 'Print Data-Entry QA Report'

This button allows the user to print out the Data-Entry QA report for any run that has been previously entered into the database. The data in the report should be manually compared to the field data to ensure that the information entered into the database is correct.



Date:	Run Type:	
3/7/2007	SW- Floodplain East (FPE)	Print QA Report
3/6/2007	SW- Floodplain East (FPE)	Print QA Report
3/1/2007	SW- Floodplain West (FPW)	Print QA Report
2/22/2007	SW- Floodplain West (FPW)	Print QA Report
2/21/2007	SW- Floodplain West (FPW)	Print QA Report
2/20/2007	SW- Floodplain East (FPE)	Print QA Report
2/20/2007	SW- Floodplain West (FPW)	Print QA Report
2/20/2007	SW- Floodplain West (FPW)	Print QA Report

After the button is pressed, the user should see a list of runs as above. The user then clicks 'Print QA Report' next to the run they are interested in and the report will open. Then they must click on the print icon  to actually print the report. To return to the menu, the user simply closes the report.

## ‘View/Edit Data Quality’

This button brings up the form that allows the user to input the subjective quality assessment score for each data value in the database.

RunDate: 8/24/2004 SampleTime: 9:20 SiteNumber: SW018 Equipment: WTW 330 with TetraCon 352 Probe, TetraCon, LF330

Parameter: Specific Conductivity - Field Value: 92 Units: uS/cm

Lowest Measurable Value: Highest Measurable Value:

**This Run's Calibrations/Checks for This Parameter**

Timing:	Reference Value:	Equipment Value:	Other:
Pre-Run Calibration Check	0.0 uS/cm	3.4 uS/cm	17.3 Fair
Post-Run Calibration Check	0.0 uS/cm	3.3 uS/cm	18.9 Fair

**Specific-Conductivity/Salinity Checks Within The Previous Two Weeks**

Timing:	Reference Value:	Equipment Value:	Other:
8/11/2004 Pre-Run	10000 uS/cm	9850 uS/cm	26.8 Good
8/11/2004 Pre-Run	1000 uS/cm	984 uS/cm	27 Good

**Suspect Sample?** ☐  
Reason(s):

**Quality Assessment**  
Poor Fair Good Excellent  
Clear Assessment  
Find Date: 7/29/2004  
Record 43231 of 50598  
Return To Menu

Details regarding the data point being evaluated are shown at the top of the form: including the run date, sample time, site number, parameter and value of the measurement. If the data point was marked as suspect during data entry this information will appear in the upper right of the form.

Calibrations and calibration checks associated with the run and the specific parameter being evaluated are shown immediately below the top blue header. For each check, the db evaluates the results and specifies whether the result is within the criteria specified in the draft Quality Criteria document and categorizes the result according to a scale of 'Excellent', 'Good', 'Fair', or 'Poor'.

For Specific Conductivity or Salinity results, a second blue header will appear below that day's calibration check information. This area will contain any calibration checks conducted during the 14 days prior to the current

measurement, which involved using either the 1,000 or 10,000 uS/cm standard solutions. If no data is shown in this area then no calibrations or calibration checks were done within the time interval specified. As with the upper area, the db will evaluate the results of each calibration check and determine how well the check meets the expected criteria.

For values measuring Dissolved Oxygen, the lower area will instead show the relevant daily calibration/calibration check information for the Oxygen Percent Saturation parameter to help enable the user to determine the accuracy of the sensor even though these calibrations are stored for the alternative oxygen parameter (% Saturation). For the Percent saturation parameter, this information is shown directly below the upper blue header as normal.

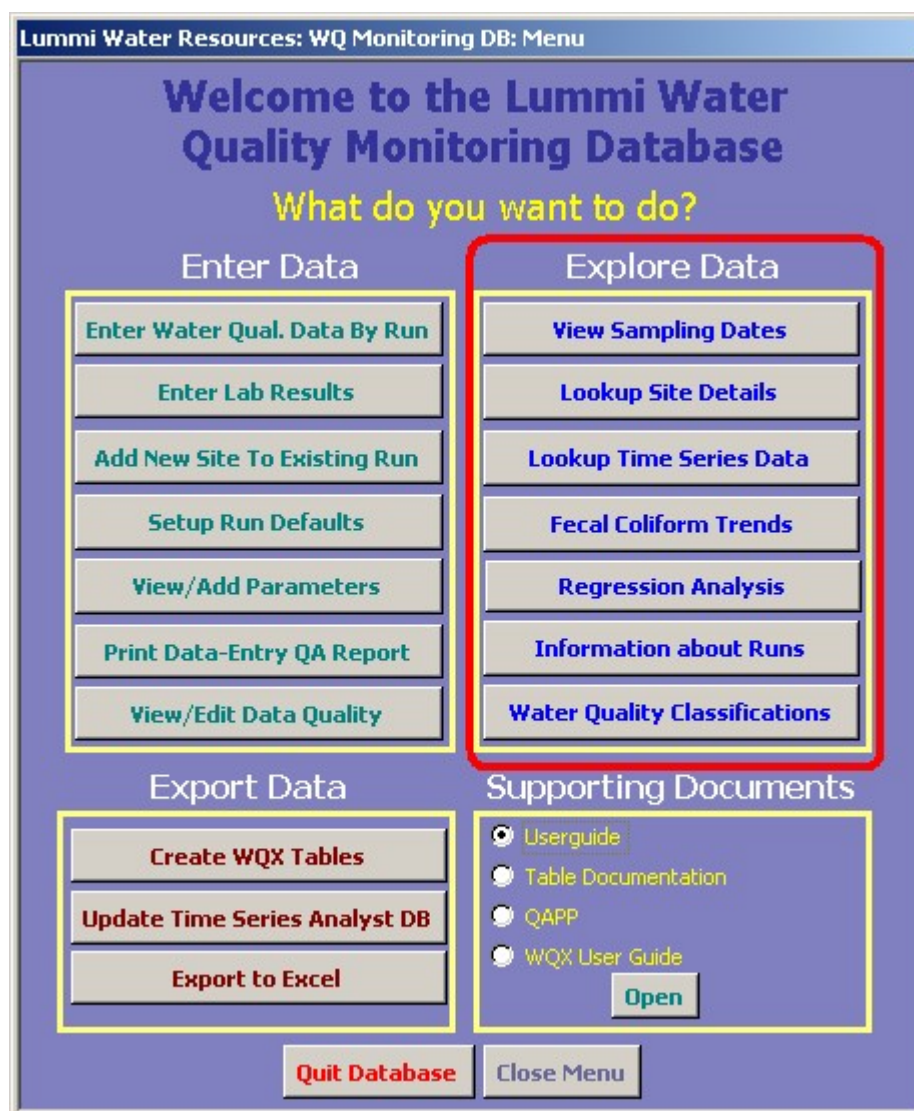
Additionally, if the sample is one of two or more replicated samples from a site then another area immediately above the suspect sample information will appear that shows the actual values of the other duplicated samples, and whether the difference between the values falls within the accepted quality assurance limits. The percentage of site-visits that had duplicate/replicate samples taken for that parameter in that run is also noted.

Once the user has evaluated all the information available to them, the user must select one option from the three presented ('Good', 'Fair', or 'Poor') to register their judgement as to the quality of the data value.

The user may skip to a particular run date by selecting a date in the 'Find Date' dropdown menu, or else navigate to the next data point by using the navigation button provided below the 'Find Date' search box.



## Exploring Data



The database can also be used to lookup information related to the sample results stored, as well as information about sampling sites such as location, directions to get to the site, photos etc.

## 'View Sampling Dates'

When the user clicks on the 'View Sampling Dates' button the main menu vanishes and is replaced with a new form.

fmSamplingDates : Form

### Show Sampling Dates

**Bold Calendar Sampling Dates if Sampling Occured Between...**  ...and...

**Select Dates Using Calendar**

**Show Site Visits between:**  ...and...

...at Site Type...  ...or... SiteNumber

**Run Date:**  **Site Number:**

**Show Results** **Pre-Post Cals** **Delete SiteVisit**

**Done/Cancel**

The purpose of this form is to open a calendar where dates that have been sampled are shown in bold. These dates can then be clicked on, or selected, and information about which sites were sampled on a given date will appear on the form. The user can then select a site visit and open up a form to display the results that were obtained on that date.

To aid the user in narrowing down the data shown, the form limits the calendar to showing sampling activities that occur between the two dates shown at the top of the form (default values are to show all sampling conducted in the previous 365

days). The user may opt to change the dates by clicking on the dates and selecting a new start/end date from the calendar that appears. (The user can select both dates simultaneously by left clicking on the desired start date in the calendar, holding the mouse button down, and dragging the mouse to select a range of dates in the calendar.)

The user can optionally choose to limit the results to sampling at a particular site, or in sites of a particular type (surface water, ground water, spill response). To do this, the user selects the desired site number or site type from the dropdown lists shown.

Once the user is satisfied with the parameters of their search, they click on the 'Show Calendar' button. A calendar should appear that shows some dates in bold (if there is any data meeting the criteria specified).

Month Calendar

Properties Close Window

January, 2006							February, 2006							March, 2006							April, 2006										
52	Sun	Mon	Tue	Wed	Thu	Fri	Sat	5	Sun	Mon	Tue	Wed	Thu	Fri	Sat	9	Sun	Mon	Tue	Wed	Thu	Fri	Sat	13	Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	25	26	27	28	29	30	31	6	1	2	3	4	5	6	7	10	5	6	7	8	9	10	11	14	2	3	4	5	6	7	8
2	1	2	3	4	5	6	7	7	5	6	7	8	9	10	11	11	12	13	14	15	16	17	18	15	9	10	11	12	13	14	15
3	8	9	10	11	12	13	14	8	12	13	14	15	16	17	18	12	19	20	21	22	23	24	25	16	16	17	18	19	20	21	22
4	15	16	17	18	19	20	21	9	19	20	21	22	23	24	25	13	26	27	28	29	30	31	17	23	24	25	26	27	28	29	
5	22	23	24	25	26	27	28		26	27	28												18	30							
	29	30	31																												

May, 2006							June, 2006							July, 2006							August, 2006										
18	Sun	Mon	Tue	Wed	Thu	Fri	Sat	22	Sun	Mon	Tue	Wed	Thu	Fri	Sat	26	Sun	Mon	Tue	Wed	Thu	Fri	Sat	31	Sun	Mon	Tue	Wed	Thu	Fri	Sat
19	1	2	3	4	5	6		23	1	2	3	4	5	6	7	27	1	2	3	4	5	6	7	32	1	2	3	4	5	6	
20	7	8	9	10	11	12	13	24	4	5	6	7	8	9	10	28	2	3	4	5	6	7	8	33	6	7	8	9	10	11	12
21	14	15	16	17	18	19	20	25	11	12	13	14	15	16	17	29	9	10	11	12	13	14	15	34	13	14	15	16	17	18	19
22	21	22	23	24	25	26	27	26	18	19	20	21	22	23	24	30	16	17	18	19	20	21	22	34	20	21	22	23	24	25	26
	28	29	30	31					25	26	27	28	29	30		31	23	24	25	26	27	28	29	35	27	28	29	30	31		
																	30	31													

September, 2006							October, 2006							November, 2006							December, 2006										
35	Sun	Mon	Tue	Wed	Thu	Fri	Sat	40	Sun	Mon	Tue	Wed	Thu	Fri	Sat	44	Sun	Mon	Tue	Wed	Thu	Fri	Sat	48	Sun	Mon	Tue	Wed	Thu	Fri	Sat
36						1	2	41	1	2	3	4	5	6	7	45			1	2	3	4	49						1	2	
37	3	4	5	6	7	8	9	42	8	9	10	11	12	13	14	46	5	6	7	8	9	10	50	3	4	5	6	7	8	9	
38	10	11	12	13	14	15	16	43	15	16	17	18	19	20	21	47	12	13	14	15	16	17	18	51	10	11	12	13	14	15	16
39	17	18	19	20	21	22	23	44	22	23	24	25	26	27	28	48	19	20	21	22	23	24	25	52	17	18	19	20	21	22	23
	24	25	26	27	28	29	30		29	30	31						26	27	28	29	30		51	24	25	26	27	28	29	30	
																							1	31	1	2	3	4	5	6	

To see the data available on a given date, the user simply left-clicks on the date of interest. To see data available in a range of dates, the user left clicks the first

date in the range and holds the mouse button down while dragging the mouse to select dates up to the last date in the range. The calendar should close and the search form should show some site visit information.

**fmSamplingDates : Form**

## Show Sampling Dates

**Bold Calendar Sampling Dates if Sampling Occured Between...**  ...and...

**Select Dates Using Calendar**

**Show Site Visits between:**  ...and...

...at Site Type...  ...or... SiteNumber

Run Date:	Site Number:	Show Results	Pre-Post Cals	Delete SiteVisit
1/6/2006	SW008	Show Results	Pre-Post Cals	Delete SiteVisit
1/9/2006	SW008	Show Results	Pre-Post Cals	Delete SiteVisit
2/27/2006	SW008	Show Results	Pre-Post Cals	Delete SiteVisit
3/15/2006	SW008	Show Results	Pre-Post Cals	Delete SiteVisit
3/29/2006	SW008	Show Results	Pre-Post Cals	Delete SiteVisit
5/3/2006	SW008	Show Results	Pre-Post Cals	Delete SiteVisit
6/1/2006	SW008	Show Results	Pre-Post Cals	Delete SiteVisit
6/20/2006	SW008	Show Results	Pre-Post Cals	Delete SiteVisit

Done/Cancel

In this case, site SW008 was visited on several occasions in 2006.

Here the user may also edit the date of the run by changing the date displayed to the left of the Site Number. Please note that such a change will also affect the run date of all sites visited during the same run.

The 'pre-post calcs' button allows the user to view any pre-run or post-run calibration check or calibration results for that run. The user may also enter such results if they have inadvertently been omitted during the data entry process.

Also, if the data-entry person erroneously entered an incorrect site number during the data entry process, and failed to delete that site visit by clicking 'Delete Site' when the site visit information was being entered, the user may delete the incorrect site visit and any associated parameter values by clicking the appropriate '*Delete SiteVisit*' button.

To see what values were measured at a site, and what the values were, the user simply clicks on the 'Show Results' button next to the site that they are interested in. A new form will open as below.

**ImShowDatafromSitebyDate : Form**

**SW008** [Show Site](#) ☒ Sampled ☐ WaterStratified ☐ SiteComments:   
☒ WaterPresent ☐ SampledOffStation

Time	Parameter	Value	UnitID	Value Type	Lower Detect Limit	Upper Detect Limit	Equipment Used	Strata	Suspect Result?	Method	
10:52	Oxygen - Dissolved Field	9.6	mg/l				Oxyguard Handy	Not Stratified	<input type="checkbox"/>	Dissolved Oxygen Using an ISE	<a href="#">NewCal</a> <a href="#">Edit</a>
10:52	Oxygen - % Saturation	81	%				Oxyguard Handy	Not Stratified	<input type="checkbox"/>	Dissolved Oxygen Using an ISE	<a href="#">NewCal</a> <a href="#">Edit</a>
10:52	Enterococcus	64	cfu/100r					Not Stratified	<input type="checkbox"/>	Standard Test Method for Ente	<a href="#">NewCal</a> <a href="#">Edit</a>
10:52	Fecal Coliform	40	cfu/100r					Not Stratified	<input type="checkbox"/>	Delayed-Incubation Fecal Colif	<a href="#">NewCal</a> <a href="#">Edit</a>
10:52	Flow	0.007	cfs			0.01		Not Applicable	<input type="checkbox"/>		<a href="#">NewCal</a> <a href="#">Edit</a>
10:52	Salinity	11.3	ppt				YSI S-C-T Model 3	Not Stratified	<input type="checkbox"/>	Salinity in Water- Electrical Con	<a href="#">NewCal</a> <a href="#">Edit</a>
10:52	Specific Conductivity - Field	19040	uS/cm				YSI S-C-T Model 3	Not Stratified	<input type="checkbox"/>	Specific Conductance	<a href="#">NewCal</a> <a href="#">Edit</a>
10:52	Water Temperature - In Situ	8.5	deg C				YSI S-C-T Model 3	Not Stratified	<input type="checkbox"/>	Temperature	<a href="#">NewCal</a> <a href="#">Edit</a>
10:52	E. coli	40	cfu/100r					Not Stratified	<input type="checkbox"/>	Delayed-Incubation Fecal Colif	<a href="#">NewCal</a> <a href="#">Edit</a>
10:54	Oxygen - Dissolved Field	10.6	mg/l				Oxyguard Handy	Not Stratified	<input type="checkbox"/>	Dissolved Oxygen Using an ISE	<a href="#">NewCal</a> <a href="#">Edit</a>
10:54	Oxygen - % Saturation	86	%				Oxyguard Handy	Not Stratified	<input type="checkbox"/>	Dissolved Oxygen Using an ISE	<a href="#">NewCal</a> <a href="#">Edit</a>
10:54	Specific Conductivity - Field	19080	uS/cm				YSI S-C-T Model 3	Not Stratified	<input type="checkbox"/>	Specific Conductance	<a href="#">NewCal</a> <a href="#">Edit</a>
10:54	Water Temperature - In Situ	8.4	deg C				YSI S-C-T Model 3	Not Stratified	<input type="checkbox"/>	Temperature	<a href="#">NewCal</a> <a href="#">Edit</a>
*									<input type="checkbox"/>		<a href="#">NewCal</a> <a href="#">Edit</a>

[Add Value](#) [Close Results](#)

This form shows all parameters that were actually measured on the day. The user may also edit the values if erroneous information is present in the table. The form may be printed using the print button, or the data exported to excel using the export to Excel button and following the prompts.

If the data-entry person forgot to enter a parameter for this site then a parameter can be added by clicking the 'Add Value' button which will open up another form where the user can input the relevant information then click 'Save'.

fm\_DataEntry\_SiteResults\_addlater : Form

Sample Taken Time	Parameter	Value	UnitID	Value Type	Lower Detect Limit	Upper Detect Limit	Equipment Used	Strata	Suspect Result?	Method
	SW008								<input type="checkbox"/>	

The user can return to the search form by clicking on 'Close Results', or can instead look at information about the site by clicking on 'Show Site'. (This will open the site information form that can also be accessed from the main menu, but it will open the form directly to the exact site indicated at the top of this results form.)

Once the user is done with the search form, they can return to the main menu by clicking 'Done/Cancel'.

## **‘Lookup Site Details’**

This button allows the user to examine information about specific sampling sites, and opens the site information form.

When the form opens it will default to the first site listed in the database. However, the user can easily switch to a different site by using the ‘Select Site Number’ dropdown list, and selecting a different site number.

The form has several tabs that contain various fields with additional information required by the EPA’s STORET database, Site photos, and date-related site characteristics such as land use statistics in the contributing portion of the watershed, as well as metrics regarding the contributing drainage area size.

The user can edit site information from this form and add new sites by clicking the ‘Add New Site’ button at the upper right of the form. The user can return to the Main Menu (or to the search results form) by clicking on the ‘Close’ button.

fmShowSite : Form

Select Site Number: **SW001** (Lummi ID) Add New Site

General | Geopositioning Information | Site Photos | Site Characteristics

Site Number: SW001 Watershed:

SiteType: SW ☒ Nutrient / Metals / Hydrocarbons Site?

Lummi WQ Classification: Marine - Class AA (Extraordinary)

Old Identifiers:

Directions:

Comments:

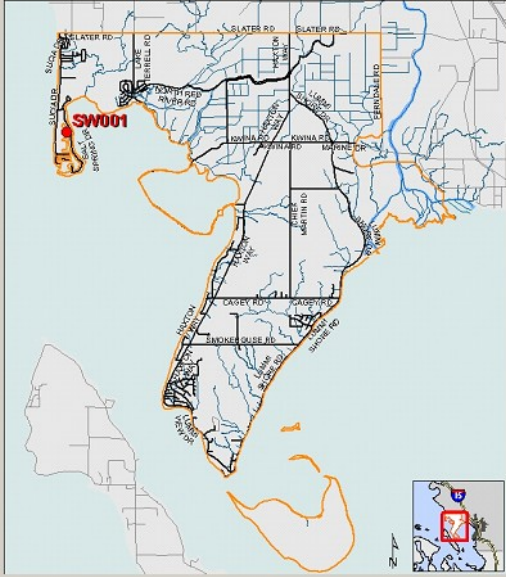
Sampling Purpose:  
 ▶ Ambient Water Quality, WQS Compliance  
 \*

WQX Primary Type: Ocean

Fecal Coliform Trends Time Series of Site Data

Select New Map Del.Map Database ID: 1

Delete Site Close



The General tab contains some information about the site identifier, watershed, and which water quality classification applies to the site, as well as a place to store any previously-used site identifications that no longer apply, directions, and a space for other comments about the site. If a map has been linked to the site, the tab also displays a map of the site. To add or remove a linked map file from a site use the command buttons provided below the map image.

It is recommended that all map jpeg files be saved in the SITEMAPS subdirectory and named using a meaningful filename convention in order to simplify the process of linking the correct file with the correct site. Only one map file per site can be stored.



The 'Time Series of Site Data' button can be used to open the time-series data form with the site number automatically filled in. Otherwise, the user may look at time-series data by using the 'Lookup Time Series Data' button on the main form. A similar button allows exploration of fecal coliform trends at the site.

The screenshot shows a web-based form titled 'fmShowSite : Form'. At the top, there is a blue header bar with the text 'Select Site Number: SW001' and a dropdown menu labeled '(Lummi ID)'. To the right of the header is a green button labeled 'Add New Site'. Below the header is a tabbed interface with four tabs: 'General', 'Geopositioning Information', 'Site Photos', and 'Site Characteristics'. The 'Geopositioning Information' tab is currently selected. The form is divided into two main sections: 'Horizontal Position Information' and 'Vertical Position Information'. In the 'Horizontal Position Information' section, there are fields for 'Lat:' (48.796496364), 'Long:' (122.706360619), 'GPSDate:' (1/27/2005), 'Datum:' (WGS84), 'Geopos. Method Code:' (GPS-Unspecified), and a checkbox for 'Site Located in Indian Country?' which is checked. In the 'Vertical Position Information' section, there are fields for 'Reference Elevation:' (1.034848), 'Elevation Units:' (ft), 'Elevation Datum:' (NAVD88), and 'Elevation Method:' (Topographic Map Interpolation). At the bottom of the form, there are two buttons: 'Delete Site' and 'Close'.


The 'Geopositioning Information' tab contains information pertaining to the spatial location of sites.

Fields labeled in red are required fields that must be populated prior to exporting the site to WQX/CDX/STORET. The orange-labeled fields are required if a reference elevation is provided.

fmShowSite : Form

Select Site Number: **SW007** (Lummi ID) Add New Site

General | Geopositioning Information | **Site Photos** | Site Characteristics



Site 7 looking east on Marine Dr.

Photo 1 of 2 ◀ ▶ Add Photo For This Site PhotoDate:

Photo Comment Delete Photo from this Site

Delete Site Close

Site photographs are viewable from the 'Site Photos' tab. Site photographs may be added using the command buttons provided. It is recommended that all site photograph files be stored in the SITEIMAGES subdirectory using a meaningful naming convention that will be unique for each file. This enables easy identification of which files belong to which site. Metadata for each photograph may be entered into the fields provided for this purpose. For example, the user may optionally input the date that the photo was taken, or record comments about the photo in the comment field. The user may link as many site photos as they wish for each site.

The screenshot shows a web application window titled "fmShowSite : Form". At the top, there's a blue header bar containing "Select Site Number: SW007" and a dropdown menu labeled "(Lummi ID)". To the right of the header is a green "Add New Site" button. Below the header is a tabbed interface with four tabs: "General", "Geopositioning Information", "Site Photos", and "Site Characteristics". The "Site Characteristics" tab is currently selected. Inside this tab, there's a section titled "Latest Site Characteristic View" which contains a table. The table has three columns: "Last Assessment", "Characteristic", and "Value". The table body is currently empty. To the right of the table is a green "Add New Characteristic" button. At the bottom of the window, there's a blue footer bar with a red "Delete Site" button on the left and a green "Close" button on the right.

The 'Site Characteristics' tab allows users to view or add miscellaneous information about 'characteristics' of the site. Site characteristics are metrics about the site that may help explain observed trends in the water quality results. For example, one potential characteristic might be the area of land in the watershed that drains to the site's location, or the number of up-gradient dairy farm operations. Because these metrics can change over time, the date that the metric was measured is also stored. Only the most recent observation for each metric is shown in the form, but the history of observations for each metric is preserved in the underlying data so that trends in land use through time could potentially be quantified in the future.

To add a characteristic to the list use the 'Add New Characteristic' button to open the new characteristic input form.

**popfm\_SiteCharacteristics\_NewValue : Form**

**Please Input New Site Observation Data Below:**

Location: SW001 Assessment Date: 3/14/2008

Characteristic: DrainageArea\_Acres New Characteristic

DrainageArea\_Acres  
LandUse\_Acres\_Agricultural  
LandUse\_Acres\_Commercial  
LandUse\_Acres\_Forestry  
LandUse\_Acres\_Industrial  
LandUse\_Acres\_Residential  
Manure\_Lagoons\_In\_Drainage  
Residential\_Structures\_In\_Drainage

**popfm\_SiteCharacteristics\_NewValue : Form**

**Please Input New Site Observation Data Below:**

Location: SW001 Assessment Date: 3/14/2008

Characteristic: DrainageArea\_Acres New Characteristic

**Input New Value to use ...**

200

Save and Close Cancel

The default date for new information will be the current date. If this is wrong, simply change the date to the actual date that the value was determined.

From the drop down list, select the desired characteristic type. If the desired characteristic is not currently shown in the list just click the 'New Characteristic' button and create a new characteristic type in the popup form that opens. When the new form closes, the new characteristic should be present in the drop down list.

After selecting the correct characteristic, simply enter the correct value and click the save and close button.

If the characteristic already appears in the list but a new value has been determined for it, simply click the Update value button next to the characteristic

name and input the correct assessment date and value as you would for a new characteristic.

The screenshot shows a web application window titled "fmShowSite : Form". The main header is blue and contains the text "Select Site Number: SW001" with a dropdown arrow and "(Lummi ID)" next to it. A green "Add New Site" button is on the right. Below the header is a tabbed interface with four tabs: "General", "Geopositioning Information", "Site Photos", and "Site Characteristics". The "Site Characteristics" tab is selected. The main content area is light gray and contains a section titled "Latest Site Characteristic Vc" with a blue background. This section has a table with three columns: "Last Assessment:", "Characteristic", and "Value:". The first row shows the date "5/13/2010", the characteristic "DrainageArea\_Acres", and the value "200". To the right of the table are two buttons: "Add New Characteristic" and "Update Value". Below the table is a large blue rectangular area. At the bottom of the window, there is a blue bar with a red "Delete Site" button on the left and a green "Close" button on the right.

Last Assessment:	Characteristic	Value:
5/13/2010	DrainageArea_Acres	200

fmShowSite : Form

Select Site Number: **GW058** (Lummi ID) Add New Site

General | Geopositioning Information | **Well Data** | Site Photos | Site Characteristics

USGSCode: 88N01E-27R01 Well\_Owner: LUMMI WTR DST, HORIZON

EcologyCode: Site Use: W

Hole Depth: 164 Water Use: P

Well Depth: 164 Chem Data: O

Driller: MC ☒ TribalOwner ☒ On Res? ☒ FieldVisit

Year: 1968 ☒ PumpTest ☒ Active ☒ Well\_Log

WQX Well Type: Water Supply/Ph ☒ Monitor

Export Water Level Data

Distance from Ground Elevation to Measuring Point

Starting Date:	Ending Date:	Distance (feet):	
5/28/1950	6/10/2009	1.6	Calc
6/11/2009		2.67	Calc
			Calc

Well Meters

Meter Name	Lat	Long
58.1	48.44877	122.39681
83065089		
*		

Well Service Addresses

Well Logs

Double-Click TextBox to browse for PDF

Open PDF

Delete Site Close

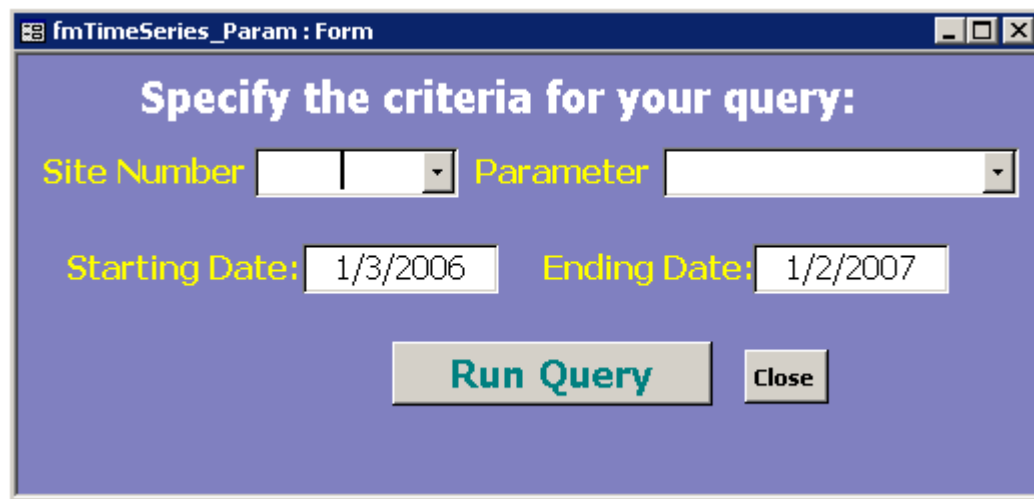
An additional tab ('Well Data') appears only if the selected site is a well. This tab shows additional information that is pertinent only to wells. This may include meters that are associated with the well, addresses serviced by the well, the distance from the ground elevation to the measuring point over time, and the location of scanned well logs.

The 'Export Water Level Data' button allows users to export all previous information about water level elevations, pump status and rates for the selected well. The exported water levels indicate the actual elevation of the water surface relative to Mean Sea Level (NAVD88) by subtracting the measured distance from the measuring point to the water surface from the surface elevation of the well site plus the vertical distance from the ground to the measuring point. The pumping information is included to help explain the data. The database will provide warning messages if there is no water level data for the well, or if it

cannot calculate the elevation of the water level due to missing supplementary information (such as ground elevation at the well, or stickup heights).

### **‘Lookup Time Series Data’**

This button allows the user to look at a time-series of results for any parameter, during a time-period of interest, at any particular site (provided that the data exists in the database).



When the time-series form opens, the user must specify a site number, parameter, and time interval for the database to search for. If this form is opened from the fmShowSite form rather than the main menu, the site number will already be filled in. Otherwise, if the form opens from the main menu, the user will need to specify both the site and parameter.

fmTimeSeries\_Param : Form

**Specify the criteria for your query:**

Site Number  Parameter

Starting Date:  Ending Date:

The form will open with a default time interval that covers the previous 365 days. If the user wishes to change the period of interest then they may left-click on either the starting date or the ending date to open a calendar.

If the user left-clicks on a single date in the calendar, that date will be saved in the box that was clicked on.

If the user left-clicks and holds the mouse button down, they can move the mouse to select a range of dates. When the user has selected a range of dates and releases the button, the start and end dates of the selected range will be saved to the appropriate boxes on the form.



Month Calendar

Properties

Close Window

January, 2006

Sun	Mon	Tue	Wed	Thu	Fri	Sat
52	25	26	27	28	29	30
1	1	2	3	4	5	6
2	8	9	10	11	12	13
3	15	16	17	18	19	20
4	22	23	24	25	26	27
5	29	30	31			

February, 2006

Sun	Mon	Tue	Wed	Thu	Fri	Sat
5			1	2	3	4
6	5	6	7	8	9	10
7	12	13	14	15	16	17
8	19	20	21	22	23	24
9	26	27	28			

March, 2006

Sun	Mon	Tue	Wed	Thu	Fri	Sat
9			1	2	3	4
10	5	6	7	8	9	10
11	12	13	14	15	16	17
12	19	20	21	22	23	24
13	26	27	28	29	30	31

April, 2006

Sun	Mon	Tue	Wed	Thu	Fri	Sat
13						1
14	2	3	4	5	6	7
15	9	10	11	12	13	14
16	16	17	18	19	20	21
17	23	24	25	26	27	28
18	30					

May, 2006

Sun	Mon	Tue	Wed	Thu	Fri	Sat
18		1	2	3	4	5
19	7	8	9	10	11	12
20	14	15	16	17	18	19
21	21	22	23	24	25	26
22	28	29	30	31		

June, 2006

Sun	Mon	Tue	Wed	Thu	Fri	Sat
22				1	2	3
23	4	5	6	7	8	9
24	11	12	13	14	15	16
25	18	19	20	21	22	23
26	25	26	27	28	29	30

July, 2006

Sun	Mon	Tue	Wed	Thu	Fri	Sat
26						1
27	2	3	4	5	6	7
28	9	10	11	12	13	14
29	16	17	18	19	20	21
30	23	24	25	26	27	28
31	30	31				

August, 2006

Sun	Mon	Tue	Wed	Thu	Fri	Sat
31		1	2	3	4	5
32	6	7	8	9	10	11
33	13	14	15	16	17	18
34	20	21	22	23	24	25
35	27	28	29	30	31	

September, 2006

Sun	Mon	Tue	Wed	Thu	Fri	Sat
35					1	2
36	3	4	5	6	7	8
37	10	11	12	13	14	15
38	17	18	19	20	21	22
39	24	25	26	27	28	29

October, 2006

Sun	Mon	Tue	Wed	Thu	Fri	Sat
40	1	2	3	4	5	6
41	8	9	10	11	12	13
42	15	16	17	18	19	20
43	22	23	24	25	26	27
44	29	30	31			

November, 2006

Sun	Mon	Tue	Wed	Thu	Fri	Sat
44			1	2	3	4
45	5	6	7	8	9	10
46	12	13	14	15	16	17
47	19	20	21	22	23	24
48	26	27	28	29	30	

December, 2006

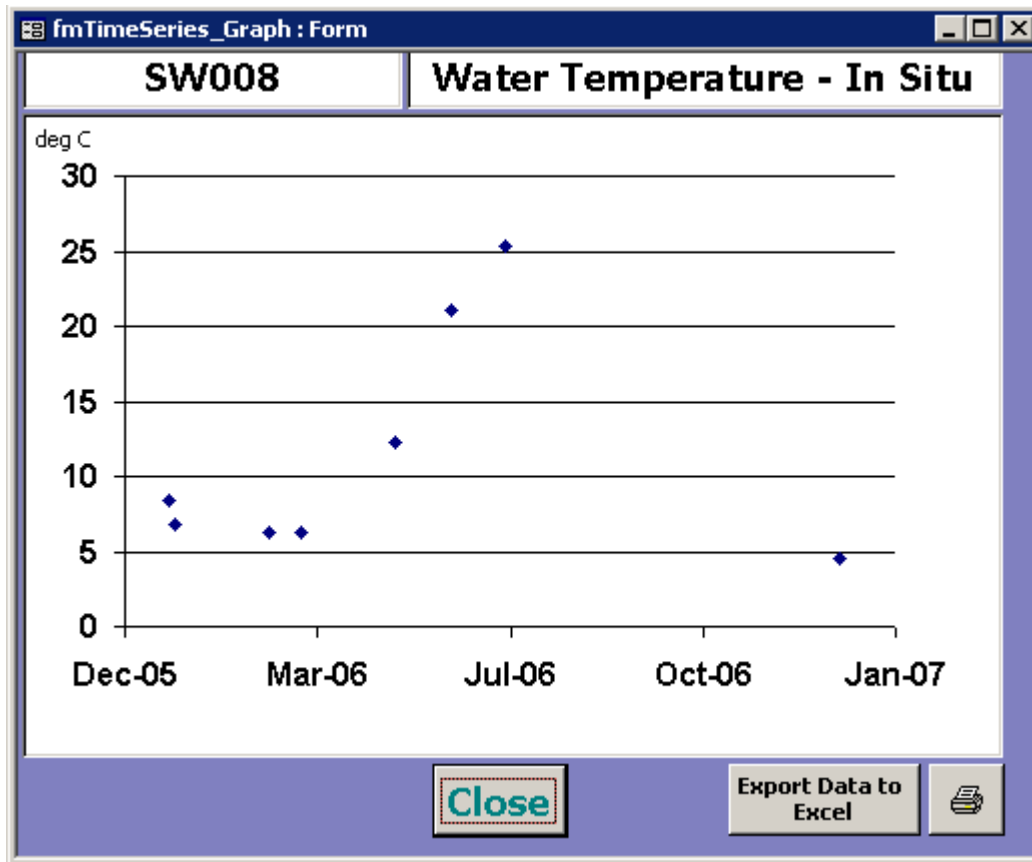
Sun	Mon	Tue	Wed	Thu	Fri	Sat
48					1	2
49	3	4	5	6	7	8
50	10	11	12	13	14	15
51	17	18	19	20	21	22
52	24	25	26	27	28	29
1	31					

Today: 1/2/2007

In this example the user left-clicked on July 4<sup>th</sup>, held the mouse button down, and dragged the mouse until dates up to December 31<sup>st</sup> were highlighted, before releasing the mouse button.

When the calendar closes, and all criteria have been set, the user may click on the 'Run Query' button to see the results. If any data exists that matches the criteria provided by the user, a new form will open that displays a graph showing the results.

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Both the x-axis and y-axis of the graph scale automatically to display the range of results generated by the query. In this case, only two results were returned during the period of interest. The graph can be printed using the print button or the data exported to Excel using the export button and following the prompts.

When the user is ready, they can close the form using the button provided, and either specify new criteria to display, or else close the time-series form and return to the main menu (or site page if the user arrived at the time series form by that route).

## 'Fecal Coliform Trends'

fmGeometricMean\_Param : Form

Site      Samples Included in Mean      Samples Included in Percentile      Show Dates...

2/14/2002 ...to... 2/13/2007

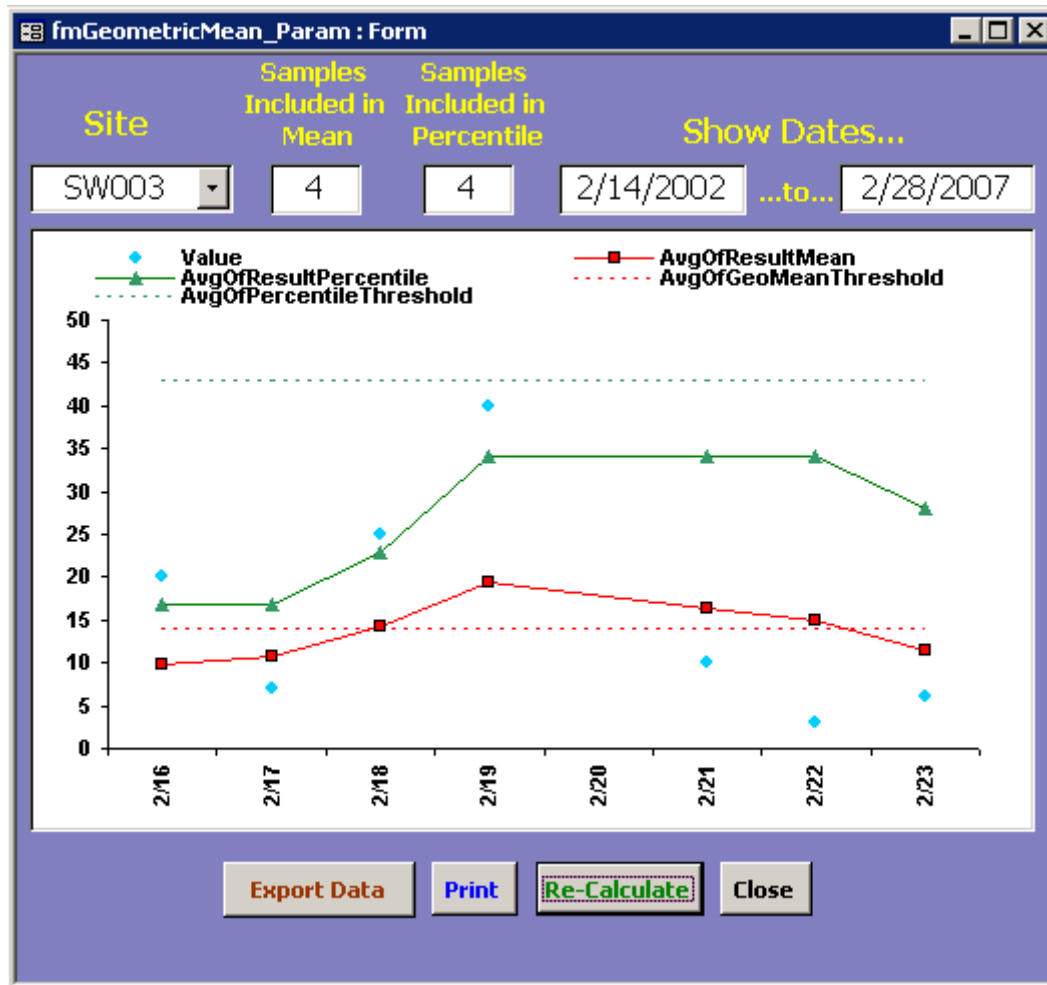
Export Data    Print    Re-Calculate    Close

When the user clicks on the 'Fecal Coliform Trends' button a new form will appear that allows the user to explore trends in the geometric mean and 90<sup>th</sup> percentile of fecal coliform counts at a specific site.

To see the graph, the user can simply choose the site from the site drop-down box. (If the user has arrived at the form from a button on the site information form, then the site information will already be filled in and the graph visible.)

If there is insufficient data in the time-period specified to calculate the geometric mean for 30 values, then the graph will be blank. The user may choose a different range of dates, or reduce the number of samples to be used in

calculating the geometric mean and percentile. Once the criteria are met, the graph will be displayed.



In this case, the graph displays the trend in geometric means and percentiles for only 4 samples (shown data fictional).

The user may then export the source data to an excel spreadsheet (Export Button), print the form and graph (Print button), or change the site number and regenerate the graph (Re-Calculate button).

When the user is done exploring fecal coliform trends, they may click on the close button to return to the main menu.

## 'Regression Statistics'

Compute Regression Statistics for Two Parameters

Start Date: 6/28/1993 End Date: 5/6/2008

Choose Dependent Variable (Y-Axis)  
E. coli

Choose Independent Variable (X-axis)  
Fecal Coliform

Choose Sites To Output

SR009	
SR010	
SR011	
SR012	
SR013	
SR014	
SR015	
SR016	
SR017	
SW001	
SW002	Marine - Class AA (Extraordinary)
SW003	Freshwater - Class AA (Extraordinary)
SW004	
SW005	
SW006	Marine - Class A (Excellent)
SW007	Freshwater - Class AA (Extraordinary)
SW008	Marine - Class AA (Extraordinary)
SW009	Freshwater - Class AA (Extraordinary)

Report using...  
☒ Individual Sites  
☐ Combined Sites

Export Regression Stats Return to Menu

The Regression Stats tool allows the user to compute the slope, intercept, and R-squared metric for a simple linear model 1 regression between two user-selected parameters for one or more sites simultaneously.

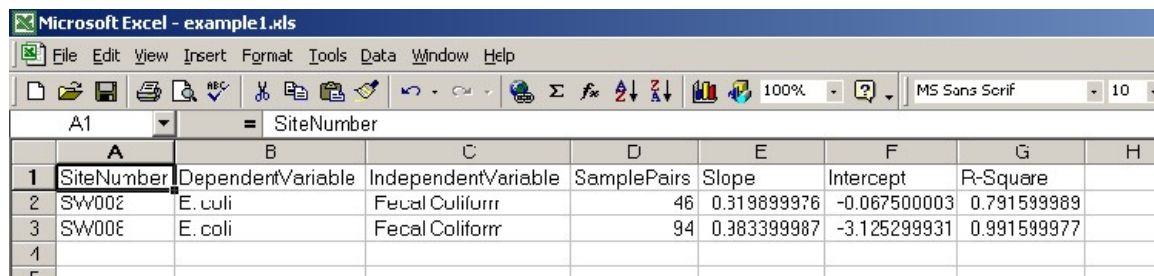
The data used by the regression tool is selected by matching data pairs based on the rundate and site-visit time and restricting the data to only those samples taken from non-stratified waters, or only the upper strata from stratified waters.

Thus, if more than one measurement exists for each parameter, at the same site,

date, and time, then each possible combination of comparisons will be treated as a data pair and included in the analysis.

Two kinds of output files may be generated by the tool:

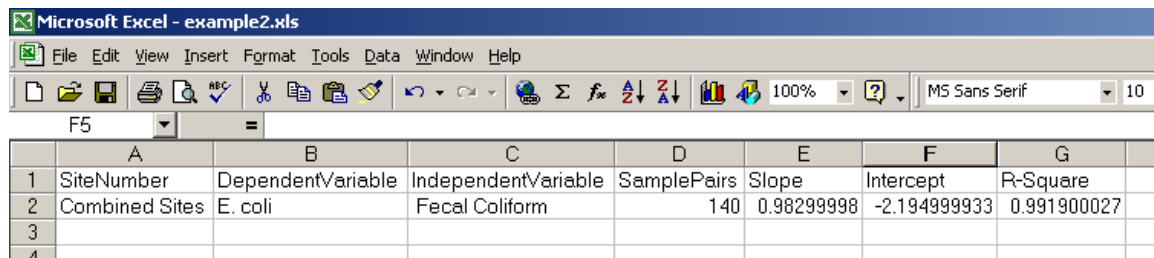
The first type is to report the regression statistics for each selected site individually. This type of report is the default, and is specified using the 'Individual Sites' option button to the right of the sites list.



The screenshot shows an Excel spreadsheet titled 'Microsoft Excel - example1.xls'. The active cell is A1, containing the formula '= SiteNumber'. The spreadsheet contains a table with the following data:

	A	B	C	D	E	F	G	H
1	SiteNumber	DependentVariable	IndependentVariable	SamplePairs	Slope	Intercept	R-Square	
2	SW002	E. coli	Fecal Coliforr	46	0.319899976	-0.067500003	0.791599989	
3	SW00E	E. coli	Fecal Coliforr	94	0.383399987	-3.125299931	0.991599977	
4								
5								

The second type of report computes the regression statistics for all selected sites as if they were combined into one data set.



The screenshot shows an Excel spreadsheet titled 'Microsoft Excel - example2.xls'. The active cell is F5, containing the formula '='. The spreadsheet contains a table with the following data:

	A	B	C	D	E	F	G	
1	SiteNumber	DependentVariable	IndependentVariable	SamplePairs	Slope	Intercept	R-Square	
2	Combined Sites	E. coli	Fecal Coliform	140	0.98299998	-2.194999933	0.991900027	
3								
4								

The output generated by the tool is an Excel spreadsheet which the user must specify a name and location for by following the prompts as they appear. If the report type is a combined sites report, only one row of data exists in the excel file and the row identifier will simply say 'Combined Sites', whereas if the report is for individual sites, the row identifier will list which site the row corresponds to.

If the user wishes to create a table of regression statistics where some sites are combined, while others are reported individually, it will be necessary to use the tool to create multiple excel output files and then manually combine the results into one table within Excel.

## 'Information about Runs'

The screenshot shows a software window titled "fmRunData : Form". It contains the following fields and controls:

- Run Performed:** A dropdown menu with "SW- Floodplain East (FPE)" selected.
- Include Metals/Nutrients/Hydrocarbons etc?:** An unchecked checkbox.
- Date:** A text box containing "10/26/2007".
- Weather and other run comments:** A large text area containing the text: "Patchy morning fog and VERY frosty out. High 51 deg. F, low 33 deg. F. Partly cloudy today. Humidity at 99%. YSI meter behaving eratically using Albertson's DH20. Used Avocet DIH20 and YSI performed within specs. PH probe being replaced, so no pH."
- Run planned but cancelled?:** An unchecked checkbox.
- Personnel:** A section with three rows. Each row has a dropdown menu and two radio buttons labeled "Field Crew" and "Data Entry".
  - Row 1: Dropdown shows "Jamie Williams", "Field Crew" is selected.
  - Row 2: Dropdown shows "Jamie Williams", "Data Entry" is selected.
  - Row 3: Dropdown shows an asterisk (\*), both "Field Crew" and "Data Entry" are selected.
- Find Run by Date:** A dropdown menu.
- Navigation:** Two arrow buttons (left and right) and a "Close" button at the bottom.

**(Note: Site-specific information is not available through this menu option.)**

This button opens up a form showing run-related information such as the date of the run, general comments, personnel, and whether the run included nutrient, metals, or hydrocarbon sampling in addition to the usual parameters being measured.

The user can click on the forward/back arrows to move to runs on other days, or else use the drop-down list to jump directly to runs on a particular date.

When the user is finished viewing or editing the data, they may return to the menu by clicking 'Close'.

## ‘Water Quality Classifications’

fmWQClassifications : Form

WQ Classification Name:

Parameter Limits

Parameter:	Statistic Type	Criterion Type	Value	Unit
Oxygen - Dissolved Field	Minimum - Daily	Lower Limit	11	mg/l
Oxygen - % Saturation	Minimum - Daily	Lower Limit	95	%
Oxygen - % Saturation	Maximum - Daily	Upper Limit	110	%
Enterococcus	Maximum - Daily	Upper Limit	61	cfu/100ml
Enterococcus	Mean - Geometric	Upper Limit	33	cfu/100ml
Fecal Coliform	Percentile - 90th	Upper Limit	110	%
Fecal Coliform	Mean - Geometric	Upper Limit	50	cfu/100ml
pH - Field	Point Sample	Lower Limit	6.5	None
pH - Field	Point Sample	Upper Limit	8.5	None
Water Temperature - In Situ	7DADM	Upper Limit	16	deg C
*				

Return To Menu

This form allows the user to view the water quality standards used by the database when exporting data to excel for comparison to standards written in the ‘Water Quality Standards for Surface Waters of the Lummi Indian Reservation’ (2007) document.

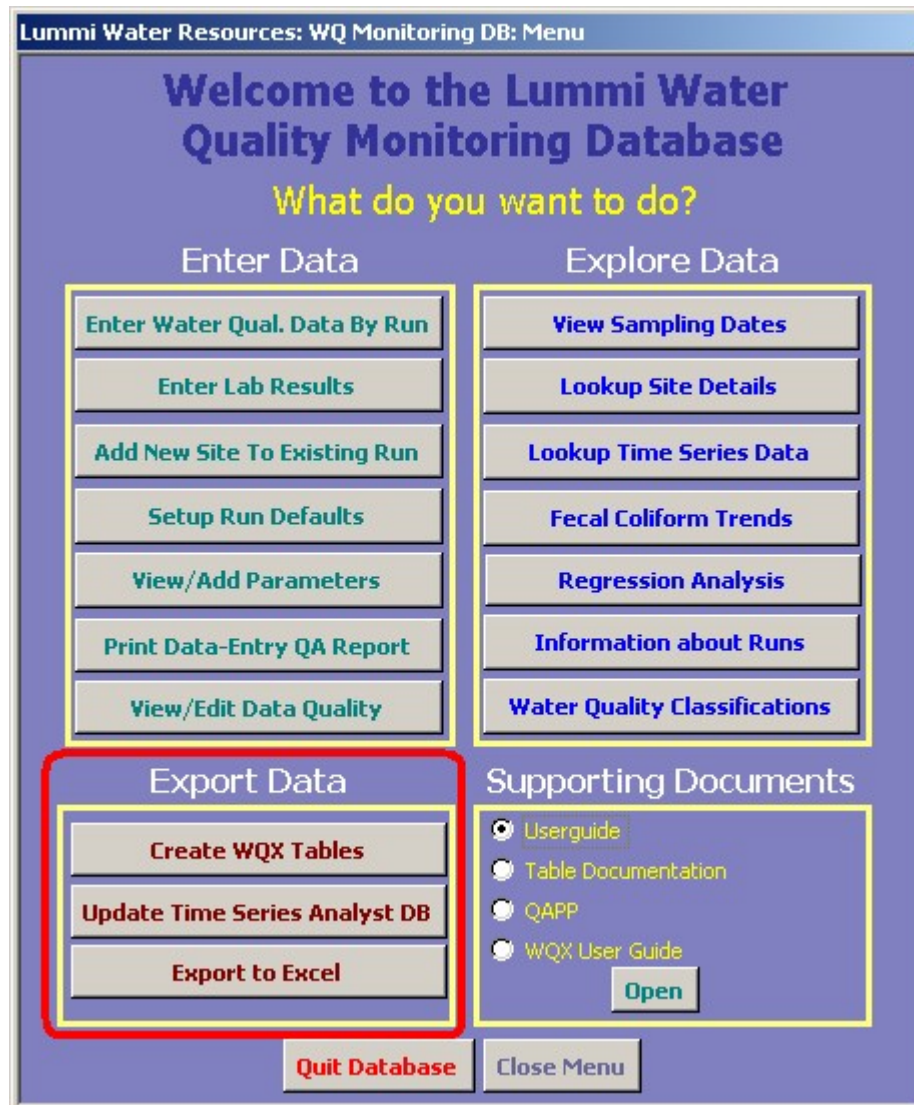
**NOTE:** While it is safe to change the numerical values used for each parameter standard, it is **NOT safe to change the existing Statistic Type, Criterion Type, or Unit for these existing standards**. Neither is it safe to delete any of the existing standards. If a user does delete/modify a standard that is referenced by the export to spreadsheet function, this will result in an error and will prevent the creation of any of the desired graphs. Please consult with the database



administrator before making any changes to the existing standards. If a user accidentally makes such a change, the error should resolve if the original standards settings are restored.

You may add entirely new standards to the list, however, these will not appear in any export outputs without modification of the export spreadsheet code module, the graphing code module, and several supporting queries.

## Exporting Data



At present there are three buttons available in this group: 'Create STORET Tables', 'Update Time Series Analyst DB', and 'Export Spreadsheet'.

## ‘Create WQX Tables’

fmExportStoret : Form

### Export Records to STORET Tables

Export records collected from... 1/1/2009 ...until... 4/7/2009 Site Type SW

☒ Export previously unexported data in date range ☐ Export all data in date range

Clear Exported Marks

Export Data Done/Cancel

When the user clicks on the ‘Create STORET Tables’ button the form shown above will open. This form requires the user to specify the time period for which they wish to export data, the types of sites to be included in the export, and also to specify whether they wish the tables to include all data results in the time range, or only those records that have not yet been exported previously.

The form will open with default dates beginning at the first of January for the current year, and the last date being the current date. The user can modify these dates by clicking the date and using the popup calendar.

Once the user has clicked on ‘Export Data’ all records that ...

1. were collected during the time period specified
2. and were collected from the selected site types
3. and have a value entered
4. and have a corresponding STORET characteristic code for that parameter

... will then be exported as tab-delimited text files that will be saved in the EXPORTRESULTS subfolder (located in the same directory as the database file). The file name will consist of an 8- digit number representing the date of the

export (mmddyyyy) followed by the site type selected for the export, and finally“\_\_ACTIVITY\_RESULTS.txt” for actual sample results, or else “\_MONITORING\_LOCATION.txt” for site information.

Please note that if the user elects to export tables that include groundwater results, the export process may take a considerable amount of time to execute as the database is has to calculate water elevation relative to mean sea level for each measurement.

The process for transferring the data from the exported text files and uploading these to STORET via WQX Web is described at the end of this document in the *Uploading Data to WQX Web/CDX/STORET* section.

The user can return to the main menu by clicking on ‘Forms’, then double-clicking on the form named ‘Menu’.

## **‘Update Time Series Analyst DB’**

When the user clicks this button the Water Quality Database updates the information stored in three tables in the Time Series Analyst Database. These tables are “Stations”, “Parameter\_Code\_Descriptions”, and “WQData”. Any new information added to the Water Quality Database since the last time the button was pressed will be added to the Time Series Analyst Database and the exported records will be marked as having been exported to the Time Series Analyst Database.

The Time series Analyst Database is located in the USU subdirectory of the Water Quality Database’s folder, and has the filename:  
‘USUTimeSeriesAnalystDatabase.mdb’.

**Note:** If the location of the Water Quality Database changes in the future (e.g., it is moved to another server) then 3 append queries will need to be altered to ensure that the WQ Database can export data to the Time series Analyst Database. The three affected queries are ‘USU\_TSA\_Stations’, ‘USU\_TSA\_ExportParameters’, and ‘USU\_TSA\_WQData’.

## 'Export to Excel'

fmExportSpreadsheet : Form

### Export Data to Excel:

Export records collected from... 1/1/2007 ...until... 12/31/2007

**Select Sites By Classification ...**

- Freshwater - Class AA (Extraordinary)
- Freshwater - Class A (Excellent)
- Freshwater - Class B (Good)
- Freshwater - Lake Class
- Marine - Class AA (Extraordinary)
- Marine - Class A (Excellent)
- Marine - Class B (Good)

**...or Choose Sites Manually**

- ALL
- DH010
- DH011
- DH012
- DH014
- DH016
- DH038
- DH039
- DH040
- DH041
- DH042
- DH043
- DH044
- DH045
- DH048
- DH049
- DH050
- DH051
- DH052
- DH053
- DH054
- DH055
- DH056
- DH057
- DH058
- DH271
- DH272
- DH285
- DH286
- DH287
- DH288
- SW001

**Choose Parameters To Export:**

- ALL
- Fecal Coliform
- Air Temperature
- Alkalinity
- Ammonia
- Arsenic
- Biochemical Oxygen Demand
- Chlorophyll a
- Chromium
- Conductance
- Copper
- Diesel Range Plus
- E. coli
- Enterococcus
- Flow - Direction
- Flow - Volume
- Hardness
- Heavy Oil Range
- Iron
- Lead
- Nitrate
- Nitrate + Nitrite - N
- Nitrite
- Orthophosphate
- Oxygen - % Saturation
- Oxygen - Dissolved Field
- Oxygen - Dissolved Lab
- pH - Field
- pH - Lab
- pH - Sample Temperature
- Salinity
- Secchi Depth
- Silica
- Silicon
- Specific Conductivity - Field
- Sulfate
- Sulfide
- Tin
- Total Kjeldahl Nitrogen
- Total Organic Carbon
- Total Phosphorus
- Total Suspended Solids

After selecting the desired sites, unselect 'All' parameters if you wish to restrict the output to individual parameters

**Export What?**

- ☐ Raw Data
- ☐ Tabular Data ☒ (Limits Also?)
- ☒ Bacteria Stats and Graphs
- ☐ Temp, pH, and DO Stats and graphs

**Export Data** **Done/Cancel**

The export to excel form allows the user to export data and graphs into an Excel Spreadsheet for further analysis or graphing. Data from one site, all sites, sites sharing the same water quality classification standards, or any combination of sites can be exported at one time.

### **Selecting Sites**

Users can select/deselect a site by left clicking on the list of sites. If a user chooses the 'All' sites option, and then changes their mind, they must deselect the 'All' option before selecting the sites they are interested in.

Alternatively, the user may choose a water quality standard classification from the Classifications list and the database will automatically select all sites in the site list that fall under that water classification.

### **Selecting Parameters**

Similarly, the user may choose to export data for one or more parameters, or all parameters that have been measured at the selected sites. The default choice will be 'All' parameters, so if the user only wishes to export a subset of the available parameters, they must deselect the 'All' option before selecting the desired parameter(s).

### **Selecting Output Types**

Once the site(s) and parameter(s) are chosen, the user can choose what kind(s) of data to export.

#### ***'Raw' Data***

Raw data is exported in four columns and sorted by ascending date as shown below. If data from more than one site is exported, the output will only be sorted by date, so the user will need to use the sort functions within Excel to manipulate the data.

	A	B	C	D
1	SiteNumber	RunDate	Parameter	Value
2	SW011	6/29/1993	Fecal Coliform (cfu/100ml)	300
3	SW011	6/29/1993	Conductance (uS/cm)	171
4	SW011	6/29/1993	Oxygen - Dissolved Field (mg/l)	8
5	SW011	6/29/1993	pH - Field (None)	7.15
6	SW011	6/29/1993	Salinity (ppt)	0
7	SW011	6/29/1993	Water Temperature - In Situ (deg C)	14.6
8	SW011	7/29/1993	Conductance (uS/cm)	195
9	SW011	7/29/1993	E. coli (cfu/100ml)	1600
10	SW011	7/29/1993	Oxygen - Dissolved Field (mg/l)	7.8
11	SW011	7/29/1993	pH - Field (None)	7.5
12	SW011	7/29/1993	Salinity (ppt)	0
13	SW011	7/29/1993	Water Temperature - In Situ (deg C)	15
14	SW011	2/18/1994	Fecal Coliform (cfu/100ml)	100
15	SW011	3/31/1994	Fecal Coliform (cfu/100ml)	41
16	SW011	3/31/1994	Conductance (uS/cm)	140
17	SW011	3/31/1994	Oxygen - % Saturation (%)	98
18	SW011	3/31/1994	Oxygen - Dissolved Field (mg/l)	11.1
19	SW011	3/31/1994	Salinity (ppt)	0
20	SW011	3/31/1994	Water Temperature - In Situ (deg C)	9.8
21	SW011	4/27/1994	Fecal Coliform (cfu/100ml)	1000
22	SW011	4/27/1994	Conductance (uS/cm)	155
23	SW011	4/27/1994	Oxygen - % Saturation (%)	96
24	SW011	4/27/1994	Oxygen - Dissolved Field (mg/l)	10.5

### Raw Data shown in Exported Form

The raw data will contain one row for each measurement of a selected parameter taken at a selected site. The user will need to use the data manipulation tools in Excel to arrange the data in whatever way they desire to perform data analysis or graphing operations.

#### *'Tabular' Data (with or without limits)*

Tabular data is arranged very differently than raw data and provides a convenient, pre-arranged format that lends itself to more rapid use for graphing within Excel. However, table data does not show multiple values of the same parameter measured at the same site more than once a day. Instead, **the table exports the average value of multiple measurements at a site within a day (if more than one value exists)**. This limitation should be kept in mind when determining how the data will be used. For example, the table data export option should NOT be used if the data is to be used for statistical analyses where variation between within-day replicates must be quantifiable. However, the data may prove helpful for a quick graphical examination of the data due to the reduced need for rearranging the data.



	A	B	C	D	E	F	G	H	I
1	RunDate	SiteNumber	Fecal Coliform (ctu/100ml)	Air Temperature (deg C)	Conductance (uS/cm)	Flow - Direction (None)	Oxygen - % Saturation (%)	Oxygen - Dissolved Field (mg/l)	pH - Field
2	6/29/1993	SW011	300		171			8	7.15
3	7/29/1993	SW011			195			7.8	7.5
4	2/18/1994	SW011	100						
5	3/31/1994	SW011	41		140		98	11.1	
6	4/27/1994	SW011	1000		155		96	10.5	
7	5/26/1994	SW011			208		111	11.1	8.42
8	5/31/1994	SW011	1000						
9	8/3/1994	SW011	850						
10	8/11/1994	SW011			184		69	6.9	
11	9/12/1994	SW011	610		202		75	7.9	7.44
12	10/14/1994	SW011	6700		176				
13	10/21/1994	SW011	420		171				
14	11/22/1994	SW011	260		124		107		
15	12/20/1994	SW011	340		134		100		
16	2/3/1995	SW011	800		59				
17	2/10/1995	SW011			273		97		
18	3/30/1995	SW011	2000		118		97		
19	4/26/1995	SW011		20.9	143	11	109		
20	4/27/1995	SW011	1300	19.05	141	11			

**Table Data shown in Exported Form**

In table form, the data is arranged with one column for each type of Parameter/Unit, as well as two columns containing the date of the sample and the site number where the sample was taken. The data is arranged in ascending date order, regardless of site.

If the option to include limits is checked by the user, the tabular data will have several extra columns appended following the data. These columns will include the statutory limits for several parameters associated with each of the sites based on the site's water quality classification. Only those limits that apply directly to data on a daily basis will be reported in this output. Limits that apply to summary statistics (such as geometric means or percentiles) are reported only in the statistics output table.

### *Bacteria Statistics and Graphs*

This option exports another worksheet in the excel workbook that contains the geometric mean and estimated 90<sup>th</sup> percentile for all bacterial data that was sampled within the time period specified by the user. Note: these statistics are not calculated using exactly 30 samples as specified in the National Shellfish Sanitation Program. Alongside these statistics for each bacteria (Fecal coliform, Enterococcus, and E. coli) are the upper and lower limits allowed under the 'Water Quality Standards For Surface Waters of the Lummi Indian Reservation'

(2007) document (where applicable) based on the water quality standard classification for each site.

In addition, a graph of the bacterial statistics and limits for each species is generated by the database inside the exported excel workbook .

#### *Temperature, pH, and D.O. Stats and Graphs*

This option creates another worksheet in the excel workbook that contains the maximum and minimum value recorded for water temperature, pH, dissolved oxygen (mg/L), and dissolved oxygen (% saturation) alongside the relevant water quality standard outlined in the 'Water Quality Standards For Surface Waters of the Lummi Indian Reservation' (2007) document for each of these parameters (where applicable) based on the water quality classification of the site.

In addition, a graph of these maximum/minimum values and associated limits for each parameter is generated by the database inside the exported excel workbook .

Once the user has decided which type of export they desire, they can click the Export Data button. The database will ask the user to navigate to the folder where they wish to save the spreadsheet, then to provide a name for the file (please do NOT include the .xls suffix...the database will append this automatically). Once this is done, the database will create the requested file in the folder requested by the user and inform the user that the export was successful.

At this point, the exported file is a normal spreadsheet and can be used in the same way as any other spreadsheet file. However, the data in the spreadsheet will NOT be automatically updated when changes/additions are made to the data in the database. It will be necessary to re-export the data to capture any such changes.

## Troubleshooting

The Water Quality Database uses a combination of Visual Basic for Applications and Queries to assist the user perform tasks such as data entry and data exports. Although the programming has been tested, it is still possible that flaws exist in the code that have not yet been detected, or that circumstances arise that could interrupt the execution of the code (such as a networking connection error).

In the event that the data entry process stalls (an expected form does not open, for example) then the database will need to be closed down and reopened. However, it will not be possible to resume the interrupted data-entry process if this occurs. As a result, all data from the interrupted run should be deleted and data entry attempted again from the beginning.

To do this, the user should close the main menu after re-opening the database and open the table 'tblSampleRuns'. The user should scroll down to the bottom record in the table and verify that the date of the bottom row is the date of the partially-entered run. If this is the case, then the user should select the last row in the table (left click on the grey square to the left of the first column) and press delete on their keyboard. A warning message may appear that says deleting the record will cause records in other tables to be deleted (due to cascading relationships). This simply means that all information in other tables that relate directly to the partially entered run will be deleted also. If the message appears then click on 'Yes' (you wish to proceed).

The user may then re-open the main menu (Forms->Menu) and attempt to re-enter the run data. If the problem recurs then it is possible that an append query has become corrupted and the database may require some repair. In this event, cease inputting data and contact Craig Dolphin or Jeremy Freimund for further instructions. The user should also note down the date of the partially entered run,

and exactly when the failure occurred during the data entry process to help narrow down the cause of the problem.

## Correcting Data Entry Mistakes

**Problem:** Entered a wrong value, detection limit value, or other similar problem

**Solution:** See page 64.

**Problem:** Forgot to add a parameter to the list of results during a site-visit.

**Solution:** See page 64

**Problem:** Added an extra parameter to the list of results during a site-visit, by mistake.

**Solution:** Follow the directions on pages 61-64 to show the list of results for that site. Left-click on the gray record selector at the left side of the form and select the row that contains the extra parameter (the record selector will turn black with a white arrow). Press delete on your keyboard. Then click Yes, you want to delete the record.

**Problem:** Entered the wrong date for a run

**Solution:** See page 63

**Problem:** I entered a wrong site number during data entry for a run, and did not click 'delete site' on the site visit form.

**Solution:** See page 63

**Problem:** What do I do if I entered a wrong site number during data entry for a run, and did not click 'delete site' on the site visit form, and the form opens to enter results for that site?

**Solution:** Uncheck all the 'Sampled' checkboxes and click 'Continue Data Entry'. Finish entering data for the rest of the run. Then see page 63 for instructions on how to remove the incorrect site visit information from the db.

**Problem:** I forgot to enter a site on the list of 'sites visited' during data entry.

**Solution:** Add a new site to an existing run. Finish entering data for the remainder of the run and then see page 48.

# **Data Entry Conventions Used**

## **Background and Rationale**

Databases depend on the data that they store to follow certain rules in order to function and also for the output from the database to be interpreted meaningfully. The rules that a database requires may include implicit assumptions and supporting data structures.

For example, the database may require that a measurement's value will always be a number. By making such an assumption it becomes possible to perform mathematical operations on the data or to create graphs of results. The alternative option would be to allow non-numeric values to be entered into the field but this then would prevent any mathematical operations to be made, or graphs to be generated. Unfortunately, sometimes real world problems occur that violate such assumptions. For example, when laboratories analyze a sample and find that the result is less than the minimum number that their equipment can measure, the result given in their report might look something like <5 ppm. The symbol < is not numeric, and the value 5 would be misleading if entered because the actual value of the result is, essentially, unknown but less than some value. To overcome situations like these, data entry conventions must be developed to allow a numeric value to be entered while still ensuring that the end user can understand that there is ambiguity about the true value.

This database was developed according to the requirements and assumptions set forth in the Lummi Nation Water Quality Monitoring Program Quality Assurance/Quality Control Plan Version 3.0 (QAPP), which was finalized on January 1, 2006. However, much of the data in the database was collected prior to that document being published and before many of the current assumptions and rules were formalized or even considered. Additionally, some situations encountered during database development were not covered by the

QAPP, or the existing solutions were deemed inadequate, and data entry conventions or supporting data structures were needed to deal with these.

For example, in the process of building the database it became clear that custom field forms for recording data were a necessary and desirable alternative to the pre-existing method of recording data free hand into field notebooks. Forms aid field staff with remembering what data is expected while they are in the field, and aids data entry by improving the readability of the data, as well as helping to organize the data uniformly and paralleling many of the data entry forms in the database.

Likewise, it rapidly became clear that there needed to be a rigidly enforced site naming convention in the department that the database could then use to maintain clarity over the physical locations of samples. This involved both a naming convention and organization/reconciliation of site names/numbers that had been previously issued using a more informal process.

This section of the user guide aims to list the data entry conventions adopted during the population of the database with historical field data to assist with interpreting the contents of the database.

## **New Site Codes**

Site naming conventions used in the database require a two-letter prefix to indicate whether a site is a regularly sampled Lummi surface water site (SW), a regularly sampled surface water site for the Washington State Department of Health (DH), a regularly sampled Groundwater site (GW), or a surface water site being monitored temporarily as a short-term response to some transitory event like a chemical spill or a sewage overflow (SR). This prefix was necessary because some site 'numbers' have been issued more than once and it was felt that re-numbering the sites could lead to confusion internally and when



communicating results to other agencies like DOH (Washington State Department of Health).

Unlike the site numbering convention detailed in the QAPP, spill response site numbers cannot be re-used in different locations. Consequently, all site number allocations, and the spatial coordinates of these locations, must be tracked. An excel spreadsheet has been created to form a master list of such sites, and any previously used designations for those sites, and is maintained by the Lummi Water Quality Specialist. In addition, the Sites table in the database provides another listing of site codes that have been sampled.

Only the site codes conforming to this convention have been used in the database.

## **Interpreting Shorthand From Old Field Notebooks**

x/cm, where x = m or u. (for measuring specific conductivity)

If x=m then the unit is mS/cm

If x=u, then the unit is uS/cm

1 mS/cm = 1000 uS/cm

$\text{‰} = \text{ppt} = \text{g/L}$

ppm = mg/L

The unit "gpm" is gallons per minute

1° and 2° = primary and secondary, respectively

## **Interpreting Flow Observations**

There are cases where flow was recorded as "<<< 1 gpm," "< 1 gpm," and "1 to 3 gpm." Historically, sometimes a narrower range than 1 to 3 gpm may be recorded. These types of results are from visual observations of flow and are summarized in Table 24 of the QAPP. These results are due to very low flows that are not feasible to measure physically. The term "<<< 1 gpm" means much, much, less than 1 gpm, "<1 gpm" means less than 1 gpm, and "1 to 3 gpm"

means a few gallons per minute.

These observations were assigned a numerical value as follows:

<<< 1 gpm entered as 0.001 cfs (cubic feet per second)

< 1 gpm entered as 0.0021 cfs (1 gpm is 0.0022 cfs)

1 - 3 gpm entered as 0.0067cfs (0.0067 cfs is 3 gpm)

## Water Depth vs Water Level?

On some occasions field staff have recorded the vertical elevation of the water surface relative to a subjective and undocumented datum for each site instead of actually measuring or estimating the depth of water at the site. This datum is referred to as the Vegetation Line. A parameter called Water Level (VG) was added to the database to allow for this data to be stored. The convention used is that 0 = the water level is at the same height as the 'vegetation line'. A negative number indicates the vertical distance between the water surface and the vegetation line (water level below veg line) and a positive number indicates the same but where the water surface is above the vegetation line.

## Interpreting Calibration 'Tables' from old Field Notebooks

A table of calibration information like this...

Standard Solution uS/cm	Temp 1 Ref. therm. C	Temp2 Thermometer C	Salinity ppt	Spec. Conductivity uS/cm
1,000	20.2	20.1	0.7	998
10,000	20	19.9	6	10,004

...was interpreted as documenting *three* calibration events.

1. The equipment used has a temperature sensor. Columns two and three show the reference value and equipment value of a temperature calibration check. (If column two is missing or blank, then this check has been skipped).

2. The equipment used has a conductivity sensor. Columns one and five show the reference value and equipment value for a calibration check for conductivity, column three shows the temperature of the solution during the calibration check for conductivity. Because the meter adjusts its reading based on the temperature to calculate specific conductivity, it is necessary to store the value in column three alongside the measured conductivity as attribute information.
3. The equipment also calculates a salinity value. Column four shows the equipment value for a salinity calibration check. The reference value for the salinity calibration check is not shown in the table. The correct salinity reference values to use are 0.5 ppt for the 1000 uS/cm standard solution, and 5.6 ppt for the 10,000 uS/cm solution.

A table like this...

Standard Solution	Temp 1	Temp2	pH
	Ref. therm.	Thermometer	
	C	C	
7		20.1	7.1
11		19.9	10.9

...was interpreted as documenting *one* calibration event. This is either a calibration or calibration check for a pH meter.

Columns one and four contain the reference and equipment values for the calibration event respectively. Column three holds attribute information about the temperature of the solution during the calibration/check because pH changes in response to temperature. This value is stored in the MiscAttribute field of the tblCheckResults table in the database.

A table like this...

Standard Solution	Temp 1 Ref. therm. C	Temp2 Thermometer C	pH
7	20.2	20.1	7.1
11	20	19.9	10.9

...was interpreted as documenting *two* calibration events.

1. As above, there is a pH calibration/check, which needs to have a reference value, equipment value, and temperature attribute value (columns one, four, and three respectively).
2. Secondly, there is also a calibration check to determine whether the temperature sensor in the meter is accurate. This involves a reference value (column two) and an equipment value (column three).

### ***Calibration vs Calibration Check?***

The terminology relating to quality assurance of the accuracy and precision of monitoring equipment has evolved over time. Current usage is based on the idea that a **calibration** involves the machine being altered, either physically or by an internal process, so that the equipment's output matches, or adjusts itself to, a user-specified value. A **calibration check** differs because the user is simply checking for the accuracy of the measurement in a known solution: the meter is not actually adjusted to get the desired value.

Old field data may use terms like 'Standardized', or 'Standardized Check' in combination with qualifiers like pre-run, mid-run, and post-run.

When entering the data from field notebooks, the following convention was used.

1. A pre-run 'Standardized' is equivalent to a pre-run calibration.
2. A 'Standardized Check', or mid/post-run 'Standardized' is generally equivalent to a calibration check.

Other specific examples:

A pre-run air check is a calibration.

A post-run air check is a calibration check

A mid-run air check is a calibration if it reads 100% or 101%, or it is a calibration check if it reads anything else.

A zero-dissolved oxygen check is a calibration check.

A pre-run pH event is a calibration

A mid-run, or post-run pH event is a calibration check.

The specific conductivity/salinity meters are checked every two weeks (calibration check).

## **Water Flow Direction**

Water flow direction is always entered as the direction the water is flowing towards. Thus, 'downstream' indicates that the water is flowing towards the mouth of the river/stream. Likewise, 'Northeast' indicates that the water is flowing to the northeast (and therefore from the southwest).

## **Nitrates, Nitrites, and sometimes both together**

Although the QAPP lists each parameter separately it is sometimes difficult for the laboratory to measure each separately and sometimes are forced to measure both parameters combined. In such circumstances, the parameter the NITRITE + NITRATE – N is used to record this information instead of individual measurements each for Nitrate and Nitrite.

## **Lab results Too Numerous to Count**

If a lab report results in a 'TNTC' (too numerous to count) result for fecal coliforms the value 2500 CFU is used for the result and the value 2500 is also entered into the upper detection limit field to indicate that this value is ambiguous. This convention matches the convention used by DOH in assessing water quality in shellfish growing areas.

### **Lab results below the minimum detection limit**

If a lab report results in a value below the theoretical minimum that can be accurately measured by the analysis method, then the convention used is to enter a value that is one significant figure less than the detection limit, and to place the value of the detection limit into the lower detection limit field to indicate that this value is ambiguous.

Thus, if a lab result for nitrates is '<3 mg/L' the value would be entered as 2.9 mg/L with a lower detection limit of 3 mg/L. If the result was <10 mg/L then the value used would be 9 mg/L and the lower detection limit would be 10 mg/L. This convention is the same as that used by DOH in assessing water quality in shellfish growing areas.

### **Codes Used to Represent Non-numerical Data**

For some parameters non-numerical observations are recorded. Since the database requires a numerical result be stored so that mathematical calculations and graphing become possible, it was necessary to create numerical codes to represent non-numerical results for some parameters. This section of the user guide is intended as an aide to interpreting numerical codes for non-numerical parameters. At this point in time, the only Parameter that requires the use of non-numerical codes is 'Flow Direction'.

Parameter: Flow Direction

Code Value	Flow Direction
1	None Evident
2	N
3	NE
4	E
5	SE
6	S
7	SW
8	W
9	NW
10	Upstream
11	Downstream

## Uploading Data to WQX Web/CDX/STORET

The general process of uploading data to STORET can be summarized as follows:

- A. Export text file containing new data from Lummi WQ database
- B. Upload text file to WQX Web
- C. Check for Errors, Correct any errors found in the Lummi WQ database, repeat A-C until no errors are identified by WQX Web
- D. Export data from WQX Web to CDX
- E. Data that is successfully exported to CDX will automatically be added to STORET by EPA

A more detailed guide follows. Note that this guide is not intended as an exhaustive user manual for WQX Web but is designed to assist Lummi WQ staff attempting to upload data to WQX/CDX and who are not already familiar with the process. The EPA has created a userguide for WQX Web and a copy of this document is accessible in the Supporting Documents section of the main menu.

1. Log in to the EPA Central Data Exchange website (requires a CDX account with authorization to write to the LUMMI\_NSN organization code. The CDX helpdesk phone number is 1 (888) 890 1995).  
<https://cdx.epa.gov/SSL/cdx/login.asp>
2. Navigate to MyCDX>WQX: WQX Web
3. Select 'Create New Dataset'
4. Select 'Import a File of Activities and Results' to import new data. Select 'Import a File of Monitoring Locations' to import new sites. (You must ensure that all monitoring locations have been successfully uploaded before you can import data for those locations)



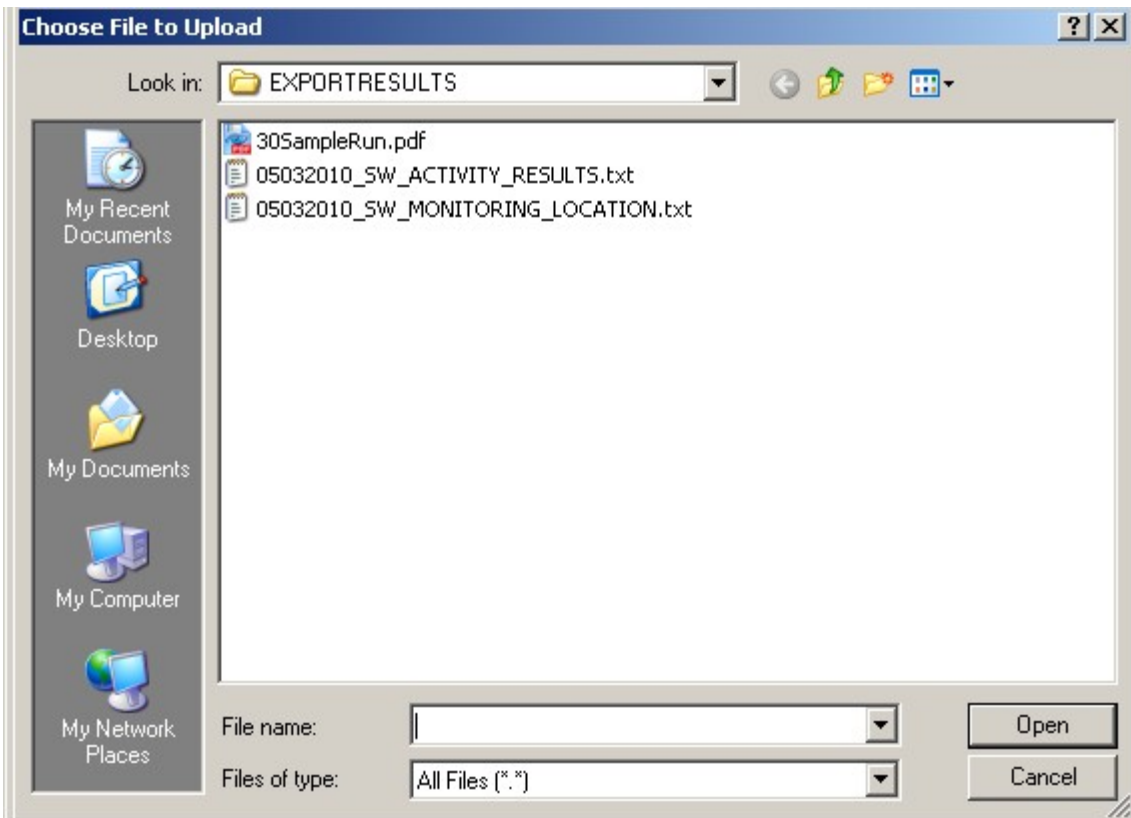
5. If you are uploading results data, choose the 'LUMMI IMPORT RESULTS' ITEM from the Import Configuration drop-down list. Note: If you are uploading stations, choose the 'LUMMI MONITORING LOCATION' option instead.

The screenshot displays the 'WQX Web' application interface, part of the U.S. Environmental Protection Agency's system. The page title is 'WQX Web' with a version number 'ver. 1.06.07.28'. The breadcrumb trail indicates the user is at 'Home >> Create New Dataset >> Import File'. The left sidebar contains a navigation menu with options: 'Import Configurations', 'Create New Dataset', 'Datasets', 'Lookup Tables', 'Event Log', 'Organizations', 'Preferences', 'User Information', and 'Logout'. The main content area is titled 'Import File' and contains the following fields and controls:

- Import Configuration:** A dropdown menu with a list of options: 'IMPORT BIOLOGICAL RESULTS', 'IMPORT HABITAT RESULTS', 'IMPORT RESULTS (wqxtest) EDIT', and 'LUMMI IMPORT RESULTS' (which is currently selected).
- Type:** A text input field.
- Import File:** A text input field with a 'Browse...' button next to it. The file type is specified as '\*.txt, \*.csv, \*.zip'.
- Attachments File:** A text input field with a 'Browse...' button next to it. The file type is specified as '\*.zip'.
- Delimiter:** A dropdown menu.
- Ignore First Row of Import File?** A checkbox that is currently checked.
- Buttons:** 'Continue' and 'Cancel' buttons are located at the bottom of the form.

At the bottom of the page, there are links for 'STORET Home', 'Privacy and Security Notice', and 'Contact Us'. The browser's address bar shows 'Internet' and the page is zoomed to 115%.

6. Click the browse button adjacent to the Import File row on the screen and navigate to the text file that you exported from the Lummi WQ database (for instructions on creating the relevant text files please see the ['Create WQX Tables'](#) section of this user guide).



The exported text file should be located in the EXPORTRESULTS subfolder, which is located within the same folder where the database itself is located. Be sure to only choose the file with the word 'RESULTS' when importing results. If you are importing new stations/sites into WQX Web, you will need to select the text file with the word 'LOCATION' in the title.

7. Ensure that the 'Ignore First Row of Import File?' checkbox is checked.

8. Once you have selected the file, click 'Open', and then click on the 'Continue' button. A small dialog window will appear warning that the first row of the file will be ignored.

After the warning dialogue is dismissed (click 'Ok'), the file will upload to WQX Web and then the WQX Web application will start to 'import' the file and check for errors. This process can take up to 45 minutes for a year of surface water data. The webpage displayed during this process will update the progress indicator at intervals of 10 seconds or 60 seconds.

The screenshot displays the WQX Web application interface within a web browser window. The browser's address bar shows the URL: `https://cdx.epa.gov/WQXWeb/DatasetSummary.aspx?datasetId=8494...`. The application header includes the U.S. Environmental Protection Agency logo and the text "WQX Web" and "U.S. ENVIRONMENTAL PROTECTION AGENCY". A navigation sidebar on the left lists options: "Import Configurations", "Create New Dataset", "Datasets", "Lookup Tables", "Event Log", "Organizations", "Preferences", "User Information", and "Logout". The main content area is titled "Dataset Summary" and contains the following information:

- A message: "This page will refresh every 10 seconds. You can also navigate to another page or close the browser and then return later to check on the status."
- Metadata:
  - Type: Activities and Results
  - Import Configuration: [LUMML IMPORT RESULTS](#)
  - Status: Importing (5.08%)
- Progress/Status:
  - Error/Warning/Message: 0 / 0 / 0
  - Start Time: 05-05-2010 12:10:16 PM
  - End Time: 05-05-2010 12:15:45 PM (estimated)

At the bottom of the main content area are "Return" and "Cancel" buttons. A "Datasets are Temporary" warning box is also present, stating: "Datasets are temporary and must be submitted to CDX to become permanent. To keep this system clean, please delete datasets that have been processed successfully at CDX or are no longer needed. The system will automatically delete this dataset in 15 days." At the very bottom of the page, there are links for "STORET Home", "Privacy and Security Notice", and "Contact Us".

8. Once the upload has been completed, you ought to see a screen something like:

**WQX Web** U.S. ENVIRONMENTAL PROTECTION AGENCY ver. 1.06.07.28  
You are here: [Home](#) >> [Datasets](#) >> Dataset Summary

### Dataset Summary

Type: Activities and Results  
Import Configuration: [LUMMI\\_IMPORT\\_RESULTS](#)  
Status: Imported

**Datasets are Temporary**  
Datasets are temporary and must be submitted to CDX to become permanent.  
To keep this system clean, please delete datasets that have been processed successfully at CDX or are no longer needed. The system will automatically delete this dataset in 15 days.

**Import**  
Error/Warning/Message: 0 / 0 / 0  
Start Time: 05-05-2010 12:10:16 PM  
End Time: 05-05-2010 12:14:48 PM  
File/Transaction ID: 05052010\_SW\_ACTIVITY\_RESULTS.txt

Record Counts	Valid	Invalid
Activity Group	349	0
Activity	444	0
Result	2254	0

[Return](#) [Delete](#) [Export/Submit File\(s\)](#)

[STORET Home](#) | [Privacy and Security Notice](#) | [Contact Us](#)

If you do not see this screen, you can reach it by navigating to it via the Datasets link in the left menu pane (blue colored vertical bar on the left of the page) and then clicking on the Dataset ID next to the file that you imported.

At this stage, you have uploaded the data to WQX Web, but this does NOT mean it has been uploaded to the CDX/STORET just yet. Before that can happen, WQX Web checks the data to ensure that there are no easy-to-catch errors in the file.

If WQX Web detects any obvious errors with the text file contents then it will display a count of invalid records and also show an additional data box on the page showing a summary of validation errors in the file.

**WQX Web**  
 You are here: [Home](#) >> [Datasets](#) >> Dataset Summary

**Dataset Summary**

Type: Activities and Results  
 Import Configuration: [LUMMI IMPORT RESULTS](#)  
 Status: Imported

**Datasets are Temporary**  
 Datasets are temporary and must be submitted to CDX to become permanent.  
 To keep this system clean, please delete datasets that have been processed successfully at CDX or are no longer needed. The system will automatically delete this dataset in 15 days.

**Import**  
 Error/Warning/Message: 1 / 0 / 0 [View Log](#)  
 Start Time: 05-05-2010 12:19:36 PM  
 End Time: 05-05-2010 12:23:40 PM  
 File/Transaction ID: 05052010\_SW\_ACTIVITY\_RESULTS.txt

Record Counts	Valid	Invalid	Validation Errors	Original	Remaining
Activity Group	349	0	<a href="#">Required Value Missing</a>	1	1
Activity	443	1			
Result	2253	1			

[Return](#) [Delete](#) [Export/Submit File\(s\)](#)

[STORET Home](#) | [Privacy and Security Notice](#) | [Contact Us](#)

Clicking on the hyperlink for validation errors will show the user the details of the problematic lines in the text file.

In some cases, such as when the value provided differs from pre-determined lists of acceptable values, the user may be able to resolve the validation problem by providing WQX with information that allows WQX to translate the provided value into one of the acceptable values for that field.

Alternatively, the user may elect to delete the dataset from WQX Web, and start over with a new text file that contains data that is modified to meet the requirements. More detailed explanation of how to use WQX Web to resolve data validation issues is provided in the WQX Web user guide.

Any data with validation errors will not be exported to the CDX/STORET. It is recommended that you do NOT export any records until you have been able to upload the file without generating any errors.

Once all validation errors have been resolved, the imported dataset can be converted into the appropriate xml format and exported to the CDX by clicking on the 'Export/Submit File(s)' button.

When the user clicks on this button, they will be given the option of creating the export xml file only, or to both create and submit the export xml file to the CDX. The correct option is to both create and submit the xml file to CDX. The user may also be required to fill in some information about who submitted the file and provide pertinent contact information. It is recommended not to check the 'Additional File (Optional)' checkbox.

Once all the required information is entered, the user can begin the process by clicking 'Continue'

9. The WQX Web application will begin processing the file for export to the CDX/STORET. Currently, this process can take up to 2 to 3 hours to export the data for one year of sampling. It is important to understand that when the file is exported to the CDX, additional validation checks will be performed that were not performed after importing the text file to the WQX Web application. This means that sometimes files that validate perfectly in the WQX Web application will fail to export to the CDX.
10. Datasets that are exported successfully to the CDX will eventually have a status of 'Completed at CDX'. In these cases, there will be four files that can be downloaded as evidence of the successful submission. It is recommended that these be downloaded and stored. After the files have been downloaded, you should delete the successfully exported dataset from WQX Web. From this screen you can delete the imported dataset from WQX Web by clicking 'Delete'

11. Datasets that fail to export successfully to the CDX will eventually have a status of 'Failed at CDX'. In this case, you will need to review the export log file and try to determine what caused the issue.

### **Some Errors that you may encounter...**

This is not an exhaustive listing of all errors that you may encounter. Most errors should be avoided using the export functionality of the database. However, there are some problems that can occur, and errors that can arise through incorrect data entry, and these are listed below.

**Example:** The importing process seems to hang-up at some stage for more than an hour (particularly at 82%).

**Explanation:** The WQX web cannot cope with the amount of data you're importing at one time.

**Solution:** Try breaking up the amount of data you're exporting into smaller time periods and try importing many smaller files instead of one large file. In 2011 the limit to the number of rows of data that can be successfully processed by WQX is somewhere between 2,100 and 4,500 rows.

**Example:** An existing connection was forcibly closed by the remote host.

**Explanation:** This error arises periodically during the export from WQX Web to CDX. It is likely the result of a network fault during transmission of the file.

**Solution:** Retry the export process with the unchanged dataset.

**Example:** Unknown Unit of Measure: pH Units

**Explanation:** This error arises when someone attempts to select something other than 'None' as the units associated with a pH reading. CDX/STORET does not allow unit descriptors such as 'pH Units', or 'Parts Hydrogen'. Accordingly, the correct unit description for pH is 'None'.

**Solution:** Find the pH readings with the incorrect unit description and change them to read 'None'.

If you run into other errors that are unrelated to data entry, then you will need to determine what is required by CDX/STORET, and examine/edit the export query to allow for this new situation. ***This should not be attempted by someone unfamiliar with developing databases,*** and it is strongly encouraged that the database be backed up immediately prior to such an action to allow for recovery if the action proves to create more problems than it solves.

## Getting Help with CDX/STORET Requirements

To get further information on WQX/CDX/STORET requirements, you could try consulting:

- The WQX Web Application User Guide (this can be accessed from the main menu, or downloaded from the EPA's STORET/WQX website)
- The STORET/WQX Website  
(<http://www.epa.gov/storet/wqx/index.html>)
- The STORET helpdesk phone line at 1 (800) 424-9067 or email address [STORET@epa.gov](mailto:STORET@epa.gov)
- The EPA Region 10 point of contact.  
([http://www.epa.gov/storet/regional\\_contacts.html](http://www.epa.gov/storet/regional_contacts.html))
  - Kol Peterson
    - (503) 326-6831
    - [peterson.kol@epa.gov](mailto:peterson.kol@epa.gov)